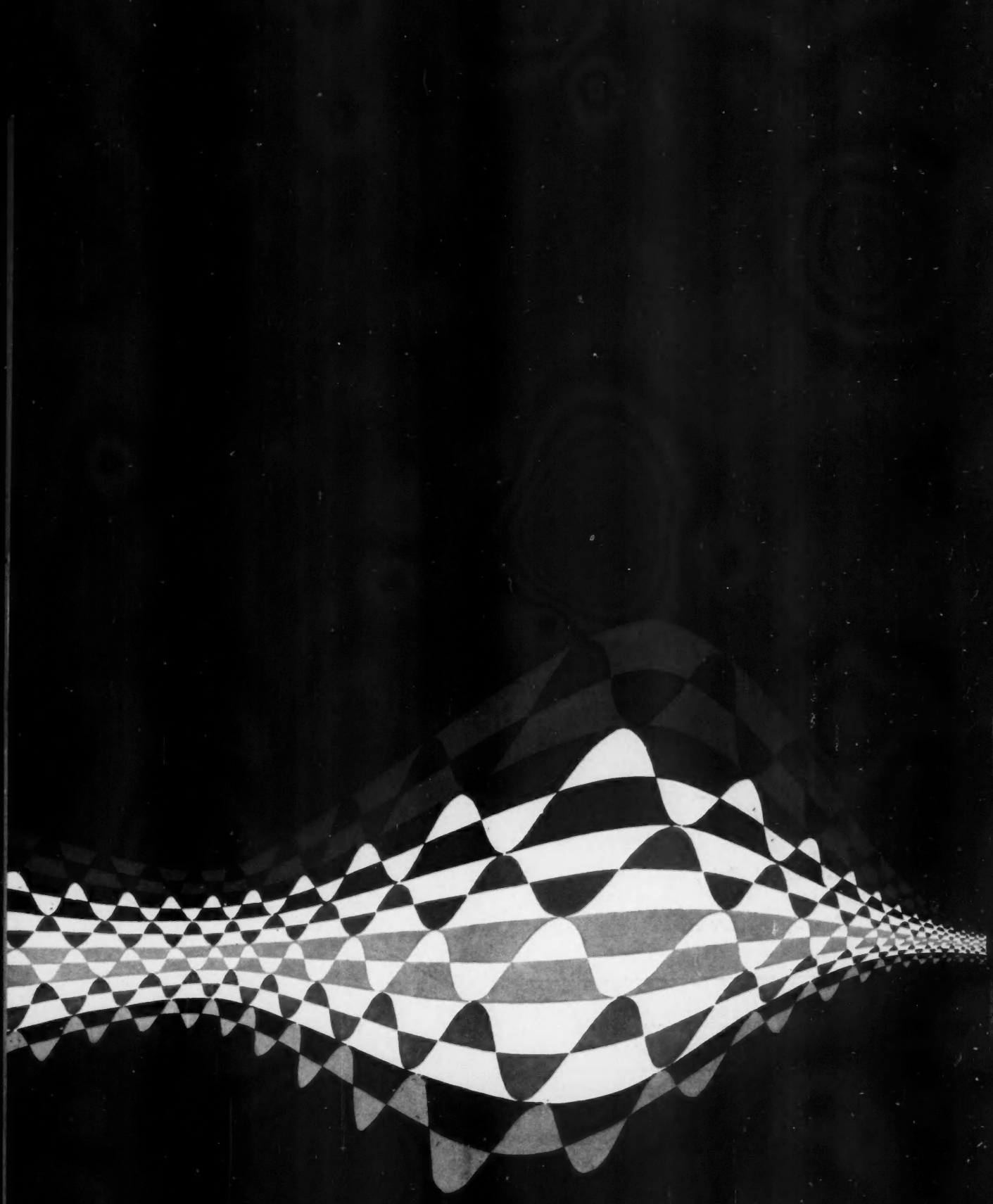

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FOR TRANSFORMERS—rely on the experience of G.E.C.

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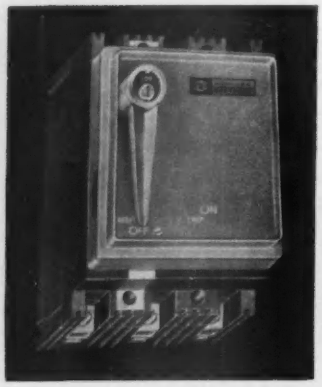
BRITISH MADE TO BRITISH REQUIREMENTS

moulded-case air circuit-breakers 15 to 800 Amps

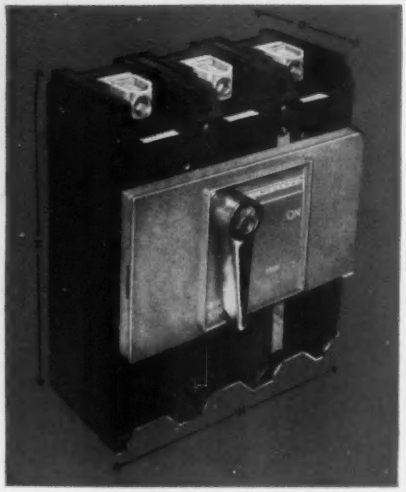
save ★ space ★ cost ★ time



NEF 100

Delivery—Ex Stock.

Ease of Assembly into MV Switchgear



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Valuable Space Saving for Hospitals, Offices, Blocks of Flats, Multiple-Stores.

NM 800

Ref.	Range Amps	H (Height)	W (Width)	D (Depth)	Volts
NEF	15–100	6⅝"	4½"	4⅛"	250v. DC 440v. AC
NFJ	15–225	9½"	4½"	5⅛"	250v. DC 600v. AC
NJL	70–400	10½"	8½"	5⅛"	250v. DC 600v. AC
NM	125–800	15½"	8½"	5⅛"	250v. DC 600v. AC

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Telephone: Wolverhampton 32521 Telegrams & Cables: "Electric, Wolverhampton"

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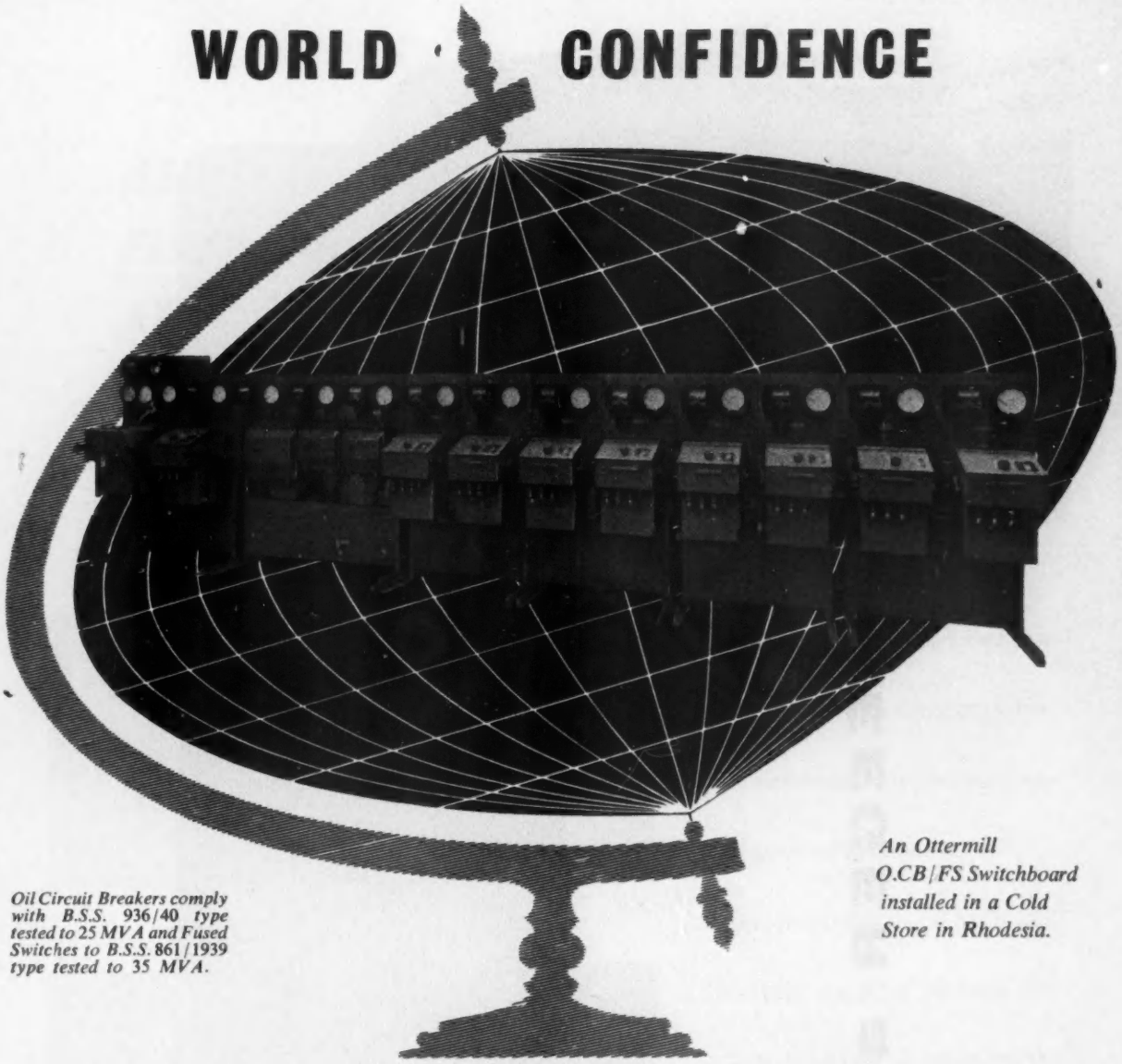

Oil Circuit Breakers comply with B.S.S. 936/40 type tested to 25 MVA and Fused Switches to B.S.S. 861/1939 type tested to 35 MVA.

An Ottermill O.C.B/FS Switchboard installed in a Cold Store in Rhodesia.

For new industries, new factories or modernisation of existing installations in all parts of the world, Ottermill Switchgear is specified because of its safety, efficiency, reliability and standardisation. Complying with British standards this top quality equipment is thoroughly tested before leaving the factory. Ottermill switchboards are fitted with oil circuit breakers and fused switches which have been type tested and are designed to withstand those short circuit conditions which may arise in industrial supply networks.

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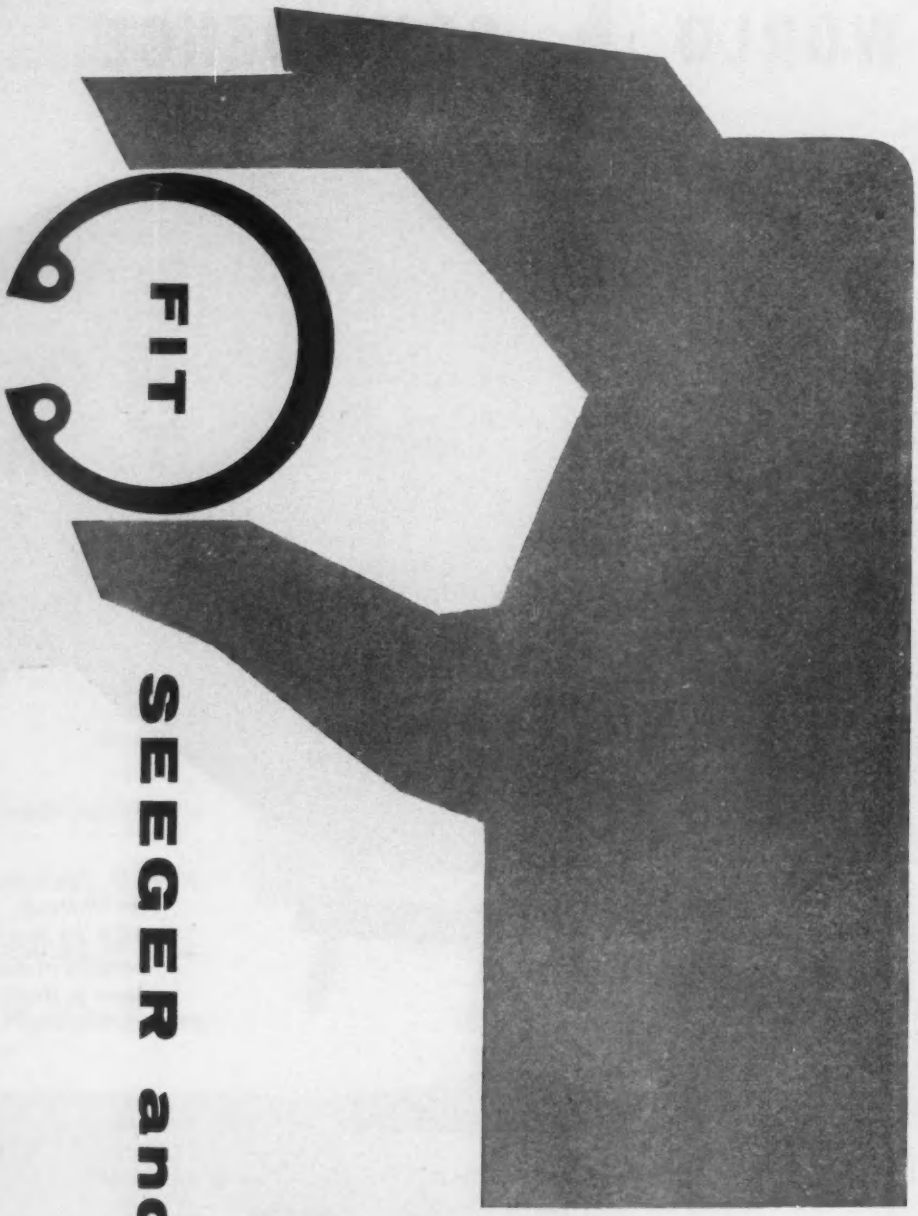

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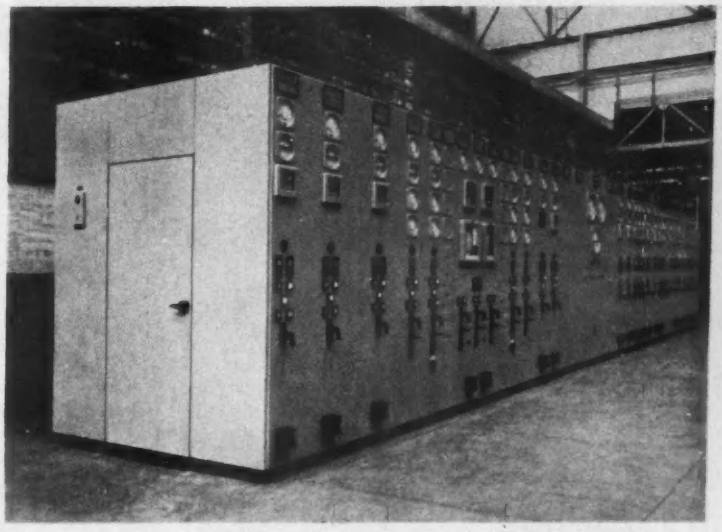
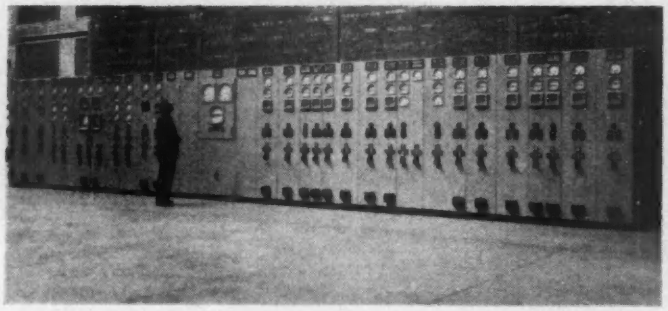
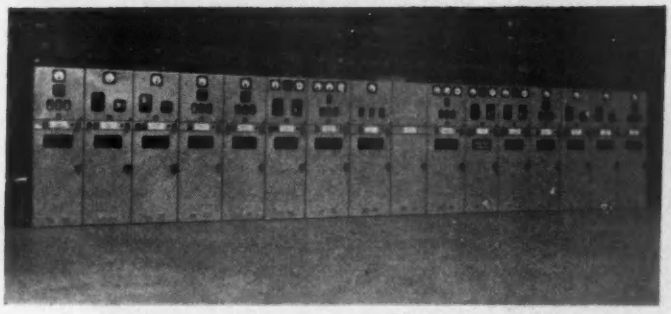
NEW PLATE MILL AT CONSETT





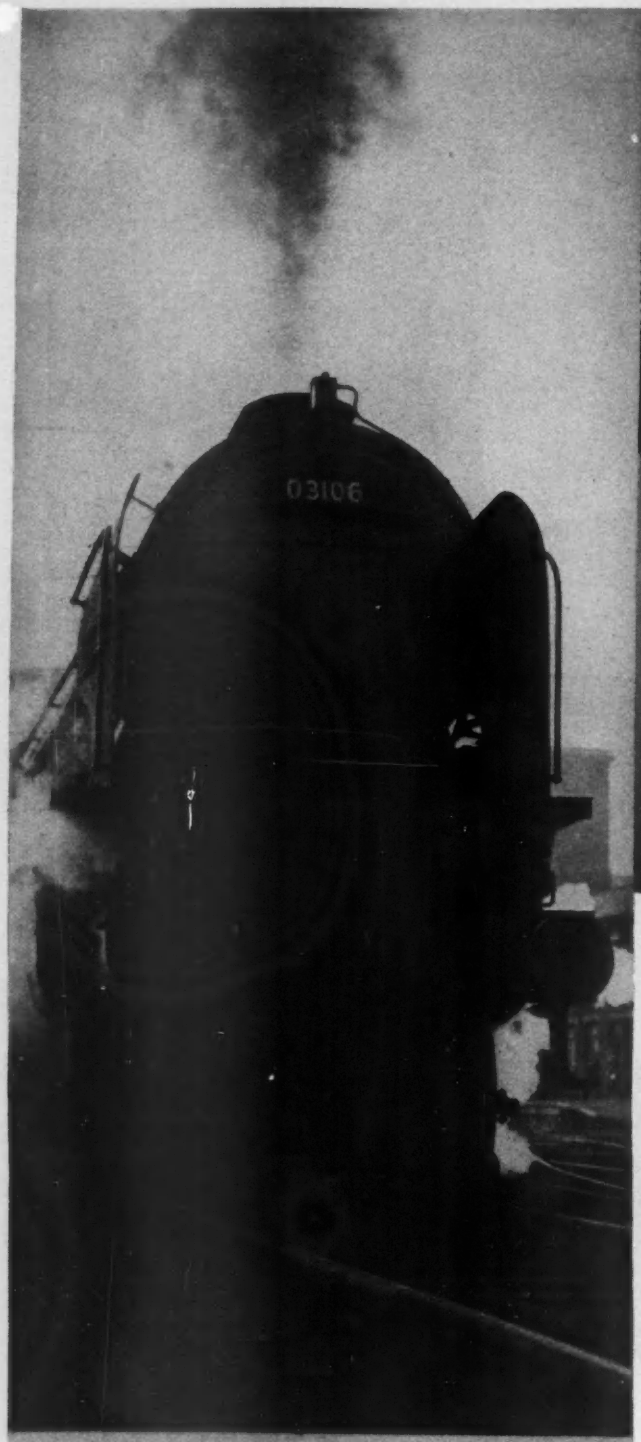


All the main distribution switchgear at the Consett Iron Company's new plate-mill installed at Hownsgill has been supplied by Reyrolle.

It comprises 11-kV 750-MVA and 350-MVA metalclad oil-break and 3·3-kV 150-MVA air-break switchgear, together with its associated control equipment.

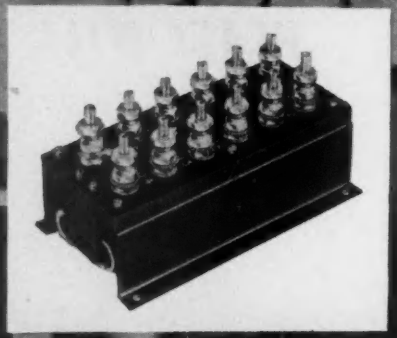
Reyrolle

A. Reyrolle & Co. Ltd - Hebburn - County Durham



Railways

ZENITH



Whether you are a commuter for steam, diesel or electric trains, the usual uneventful daily journey is only possible through the signalling system of British Railways.

Our larger inset picture illustrates a track feed installation at Finsbury Park, Eastern Region. The track circuit forms the basis of modern signalling. A current flows through the rails, insulated for this purpose, operating a normally energised relay. As a train enters the track circuited section its axles offer a better path, so the relay is de-energised and occupation of that section detected.

Tapped track circuit feed resistandes regulate the current flow, and are adjusted to pass a current through the relay when that section of the track is unoccupied.

***CERAMITE** wire wound, embedded resistors ensure complete reliability, having approval in Class H1.*

We should be pleased to advise you on resistor matters and happy to send our catalogue.

*Registered Trade Mark

Photograph by courtesy of British Railways

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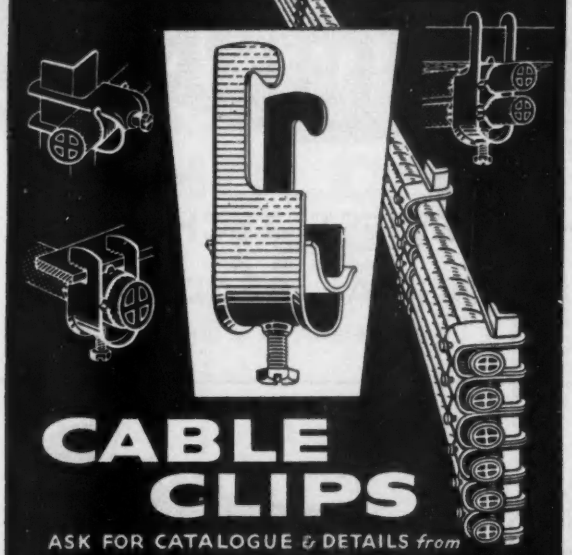

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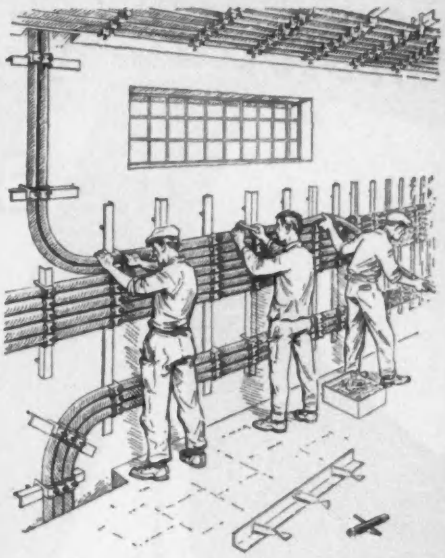
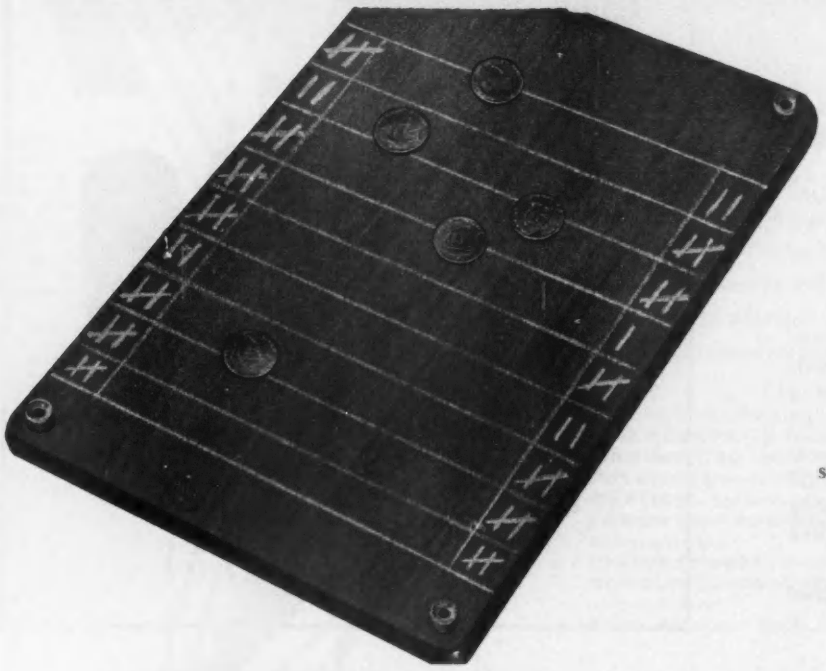


SHOWING THE SIMPLICITY AND ECONOMY OF POHL CABLE CLIPS



Wootton meter boards win every time!

Obviously, when they're Wootton-made, and Wootton-tested. Made from the best plywood Wootton could lay hands on. Tested for reliability . . . toughness . . . durability. Wootton meter boards stand up to anything. No contraction or expansion or warping with Wootton! Oh, and there's more to Wootton than just meter boards. They make wood blocks too, and instrument cases, and they're brilliant at sunk switch boxes.

WOOTTON–the meter board people

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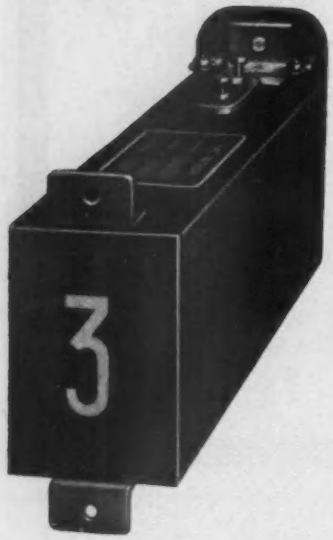
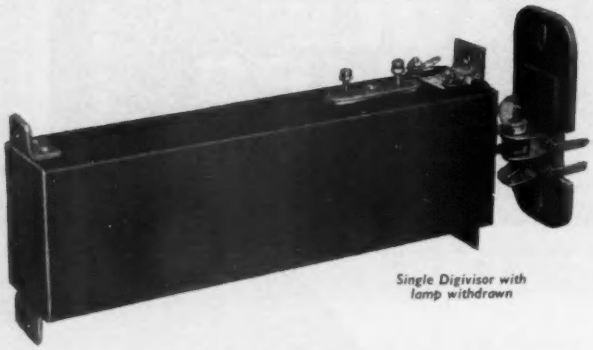
Introducing

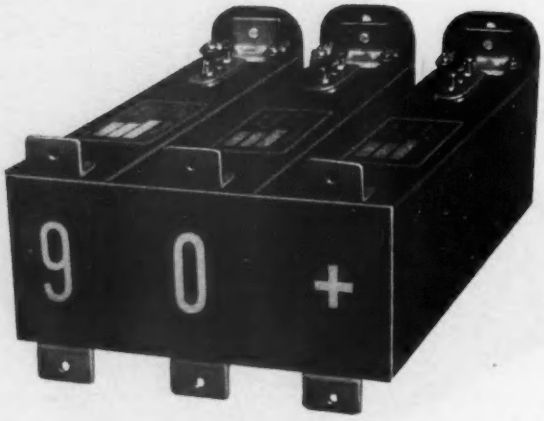
the EAC DIGIVISOR



THE NEWEST TECHNIQUE IN DIGITAL READ-OUT



Single Digivisor with lamp withdrawn



Triple Digivisor read-out display

The E.A.C. Digivisor provides an illuminated digital read-out from a single light source, the digits being moved by means of a miniature moving coil device.

The lamp may be permanently energised and varying digits can be displayed by the application of a stepped D.C. supply to the moving coil system.

The E.A.C. Digivisor therefore offers a direct digital read-out with the simplicity and robustness of a moving coil instrument.

The Digivisor shows digits approximately 1" high and requires only 250 microamps for full deflection enabling it to operate direct from transistorised circuits.

Further details will be supplied upon request.

THE ELECTRICAL APPARATUS COMPANY LTD EAC ST. ALBANS

WHEN LENGTHS OF DEEP SEA CABLE ARE HANDLED ABOARD H.M.T.S. MONARCH

Preformed HOLDS THE LINE....

H.M.T.S. Monarch is currently laying a deep sea telephone cable to Canada as part of a projected Commonwealth round - the - world link-up. Photograph by courtesy of H.M. Postmaster-General.

... because the unique Helical gripping of PREFORMED Dead Ends* gives low localised stress. It holds the extra high tensile steel core of this revolutionary type cable through *five slip surfaces* without damaging the polythene sheath. This is an outstanding example of the extreme holding power of PREFORMED Dead Ends. Easily and quickly applied— PREFORMED Dead Ends are the discerning engineers choice.

Other Preformed Products Include:
LINE GUARDS—*for conductor protection at insulators*
LINE SPLICES—*full tension joints*
PATCH RODS—*for repair of strands*
GUY GRIP *Dead Ends—the most economical way of making-off stays*
ARMOR GRIP SUSPENSION ASSEMBLY—*a revolutionary suspension clamp*
SPLICE SHUNTS—*for overheated joints*
BUNDLED CONDUCTOR SPACER UNITS—*the best twin conductor spacer*
*Patent Application Number 817535

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Other products mentioned are covered by patent and patent application Nos. 817055, 817534, 806333, 817643, 817644, 708908, 817535

Agents in Countries Throughout the World
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Introducing

the EAC DIGIVISOR

THE NEWEST TECHNIQUE IN DIGITAL READ-OUT

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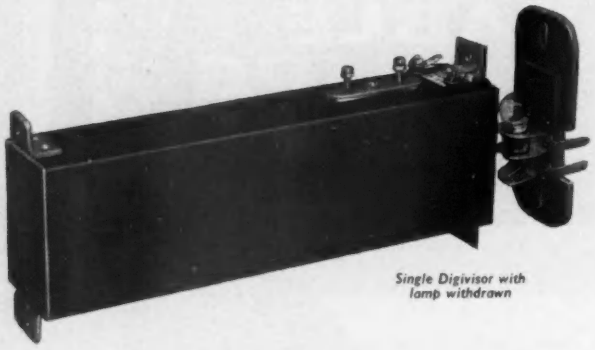

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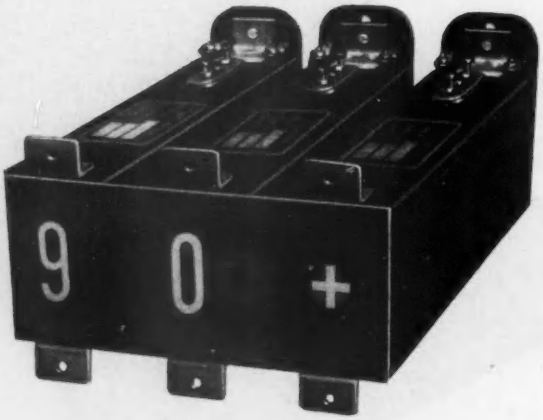

Triple Digivisor read-out display

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Agents in Countries Throughout the World

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Whatever started it, one thing is certain; *combustible materials kept it going.* It's sound sense, then, to investigate the proved qualities of Het Acid. Materials fabricated from polyesters based on Het Acid will not support combustion. Unfed, the fire dies at source.

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☐ High strength with light weight ☐ Non-deterioration of fire-retarding properties in all climates ☐ Resistance to corrosion and chemical attack ☐ Resistance to temperatures up to 150°C.

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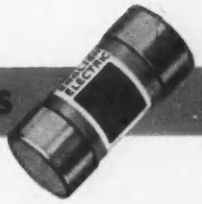

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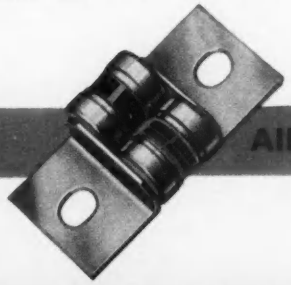
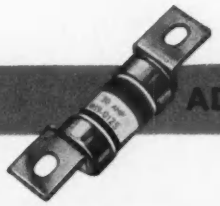


AIRCRAFT



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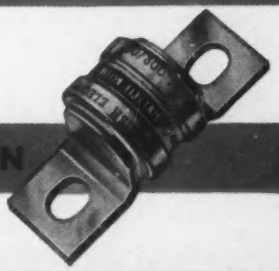

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FG 64

Electrical Times, 9 November, 1961

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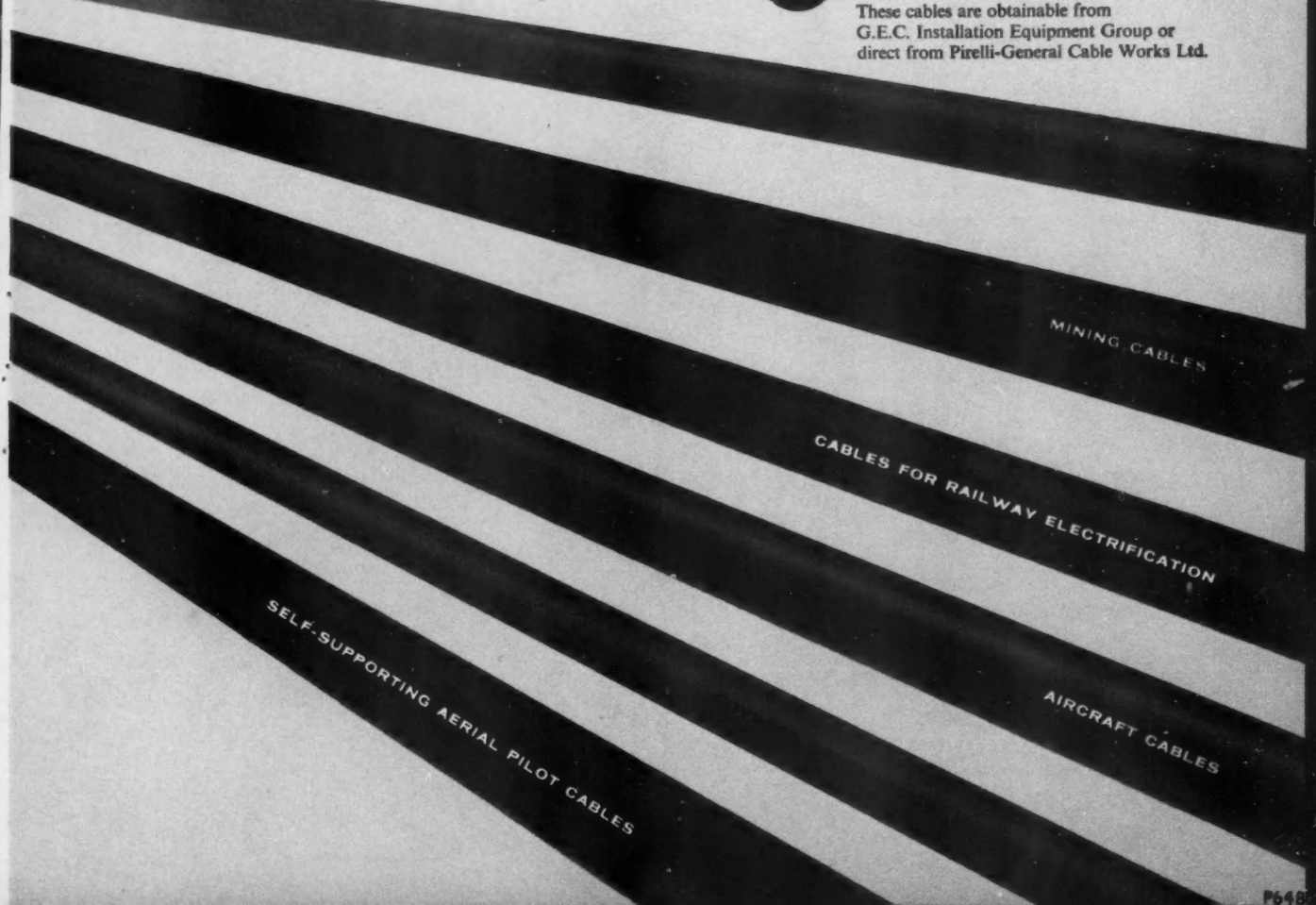
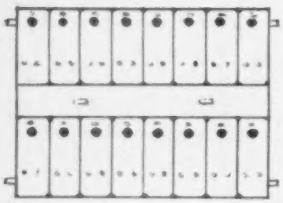
These cables are obtainable from G.E.C. Installation Equipment Group or direct from Pirelli-General Cable Works Ltd.

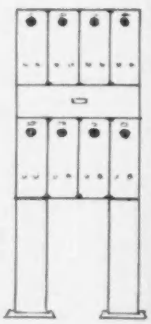


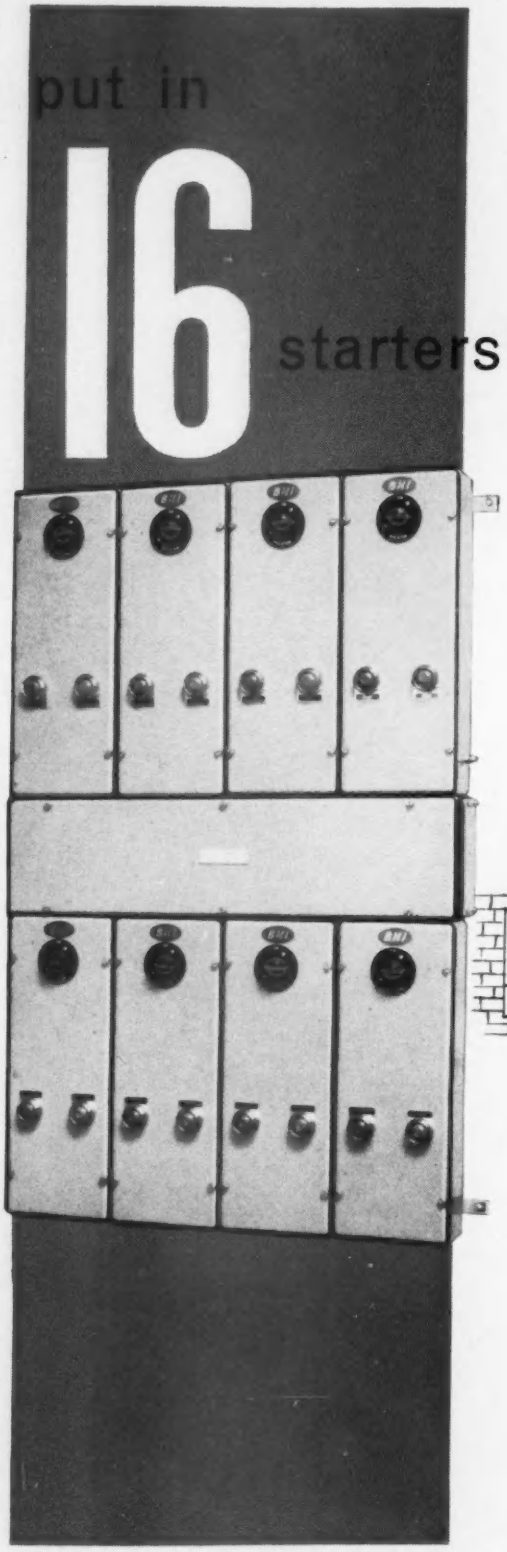
take out a brick put in 16 starters!

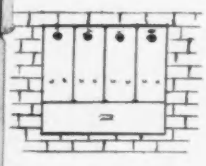
The BUSBAR Eight-Sixteen-One Twenty, BHI's new compact starter switchboard, is ONLY ONE BRICK DEEP. By removing only one layer of standard bricks you can mount it almost exactly flush.

The model only 28″ wide carries any number up to *eight* starters, the 56″ model up to *sixteen*—a top total of *one-twenty* horse-power.









starters for up to 7½ h.p., across-the-line, each with integral isolator and H.R.C. fuses

starters already connected to built-in busbar run—
you merely clamp 3 supply wires

you can order without busbars, to use the chamber as cable trunking

suitable for floor and wall mounting as well as flush fitting

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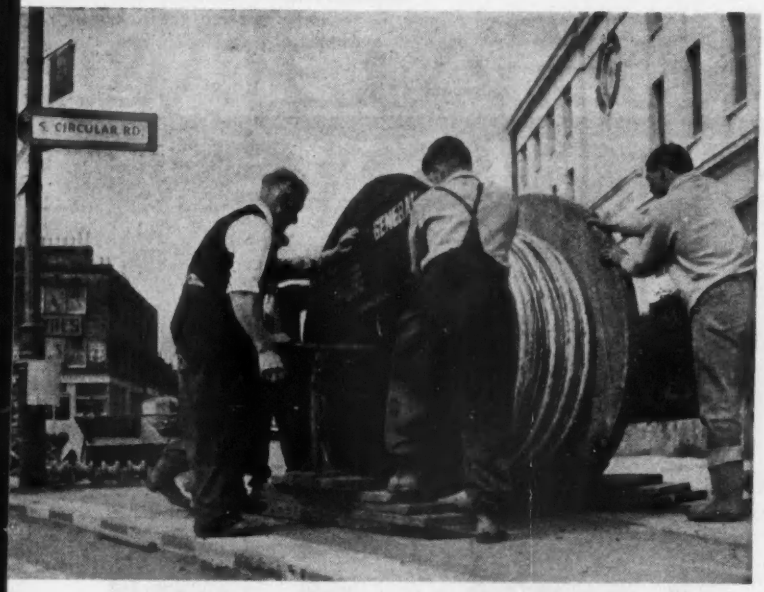

These cables will be as good as new in A.D. 2011

These gangers and jointers are laying cables made with aluminium conductors. It's a sight that is becoming increasingly familiar in British cities, from London to Glasgow. It means power PLUS for homes, factories, offices and mines. The PLUS is Alcan aluminium in those conductors. They will still be carrying their load 50 years from now.

The gangers are installing 4 core ·3 sq. in. low-voltage distribution cables. Aluminium is also increasingly used in high-voltage and extra-high-voltage feeders. It has great advantages for the sheathing of pressure-type cables. Jointing presents no problems.

Today, aluminium is the cheapest conductor material. Alcan production capacity and Alcan research make sure that it will hold its lead.

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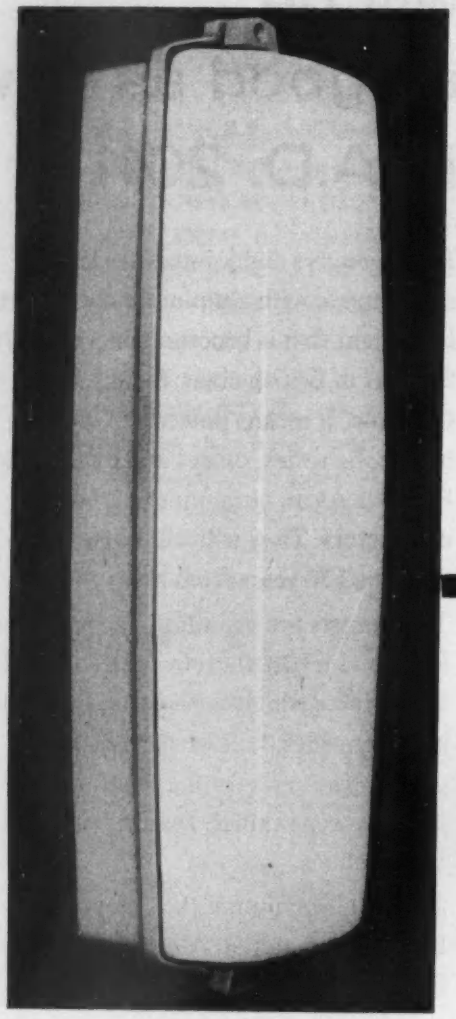

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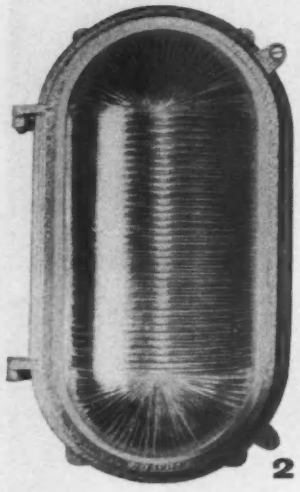

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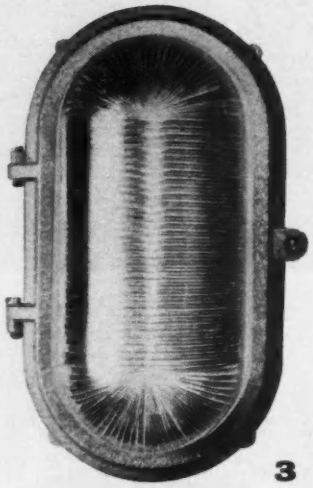

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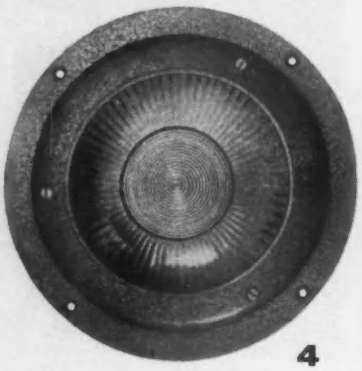

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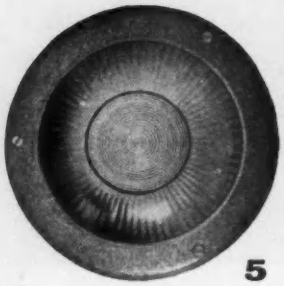

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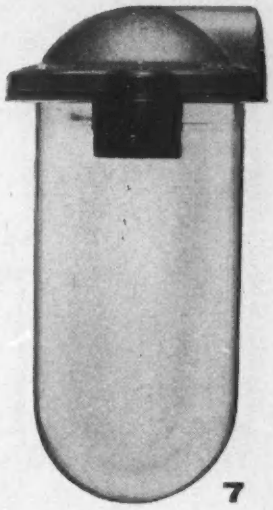
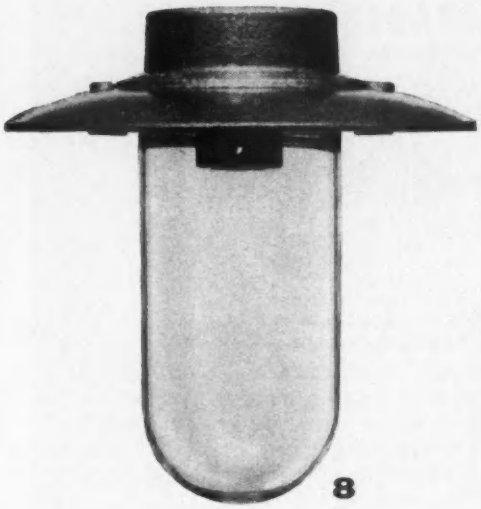

7

Four standard fittings (Nos. 6, 7, 8 and 9) are illustrated on this page and each is available in either Die-cast aluminium alloy or cast iron, Stove enamel hammered grey finish or galvanised cast iron. Clear wellglass is mounted on a rubber seating washer and is located by two fixing lugs designed to allow removal of glass without detaching screws. 40, 60 or 100 watt tungsten lamps are suitable for these fittings. Wire guards and matching backplates and brackets are available if required. For full details refer to our leaflet which is obtainable from the address below.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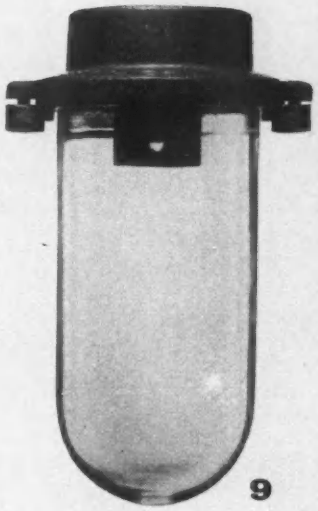
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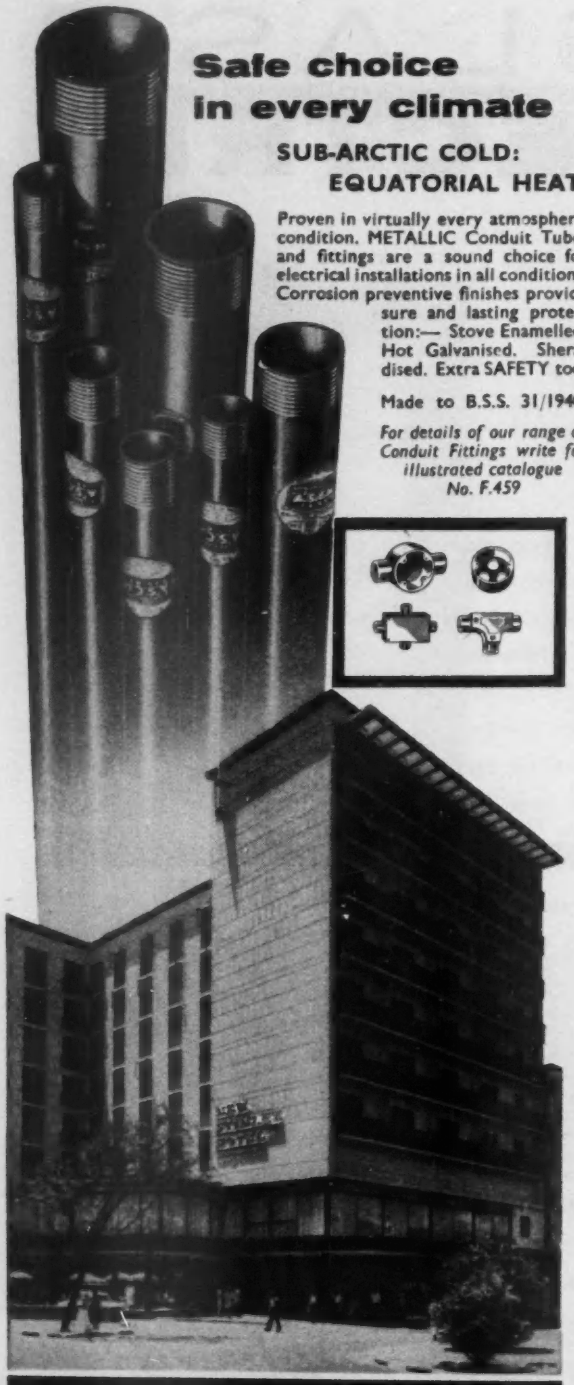

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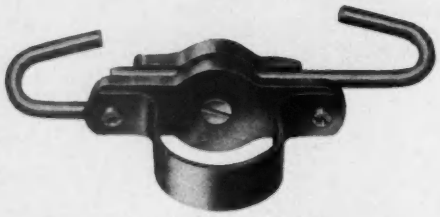

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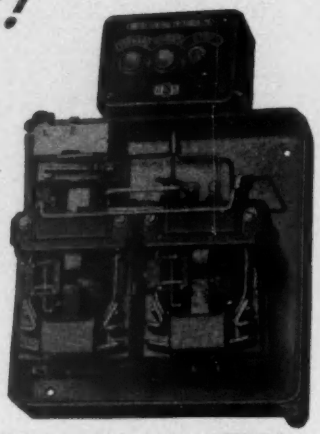

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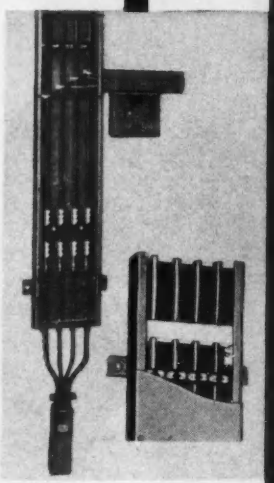

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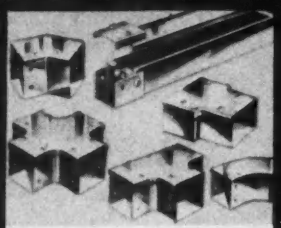

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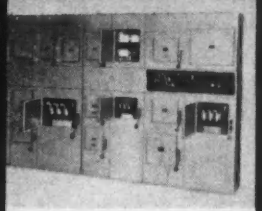

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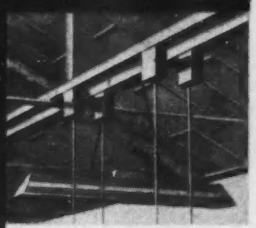

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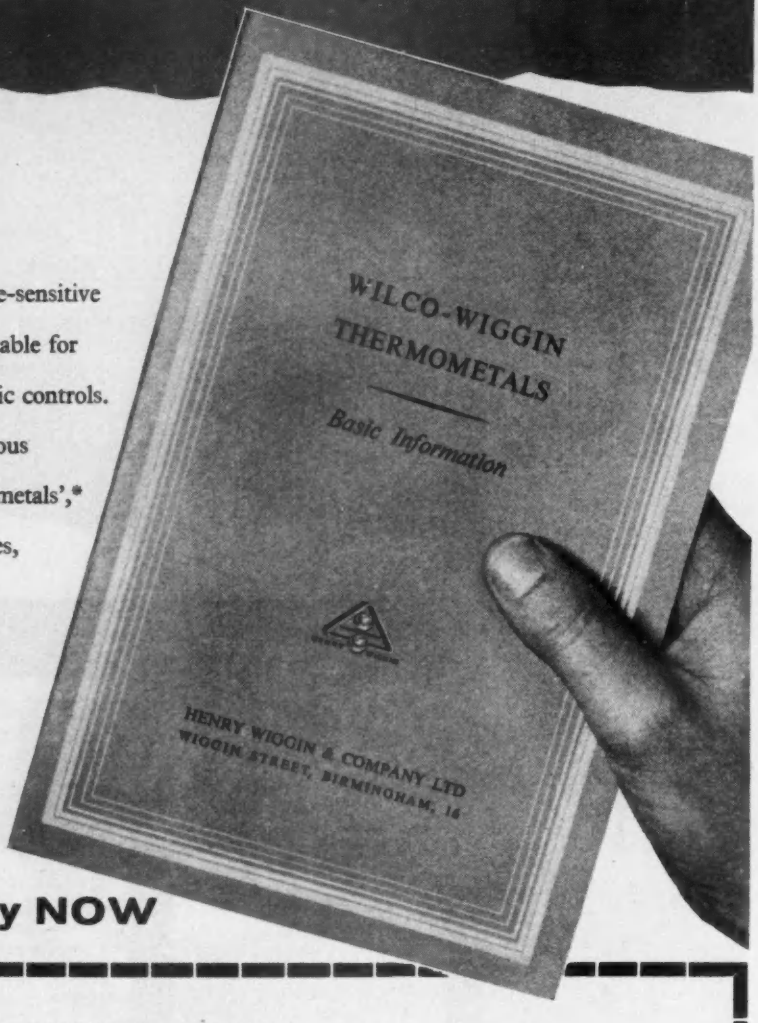

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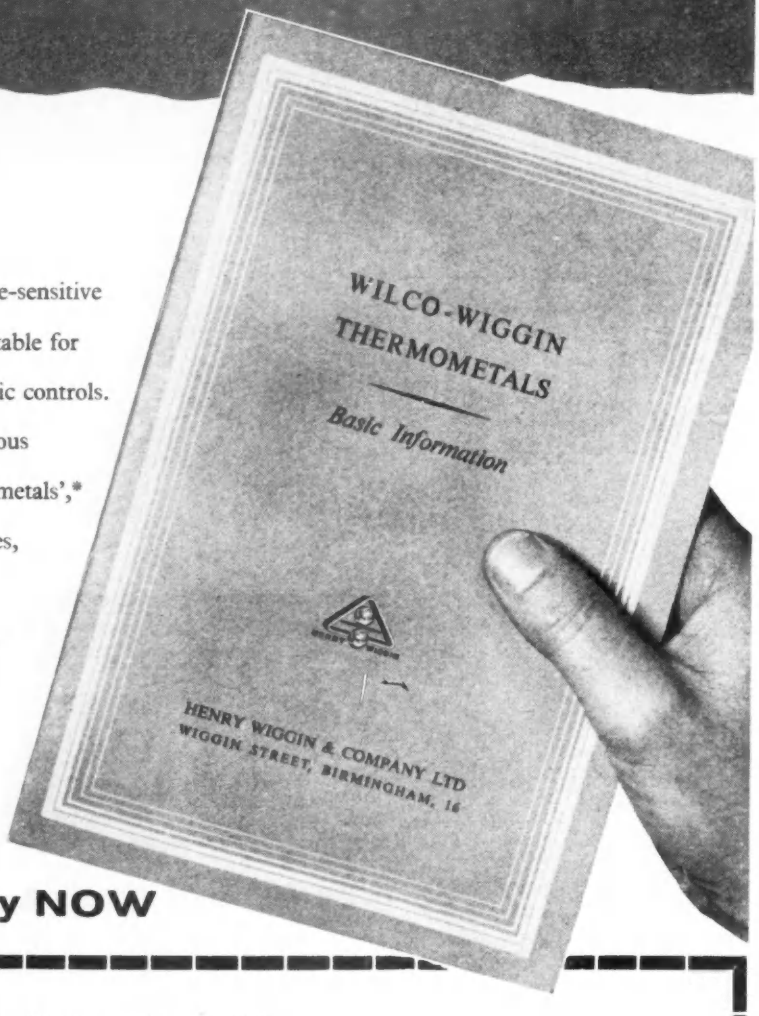

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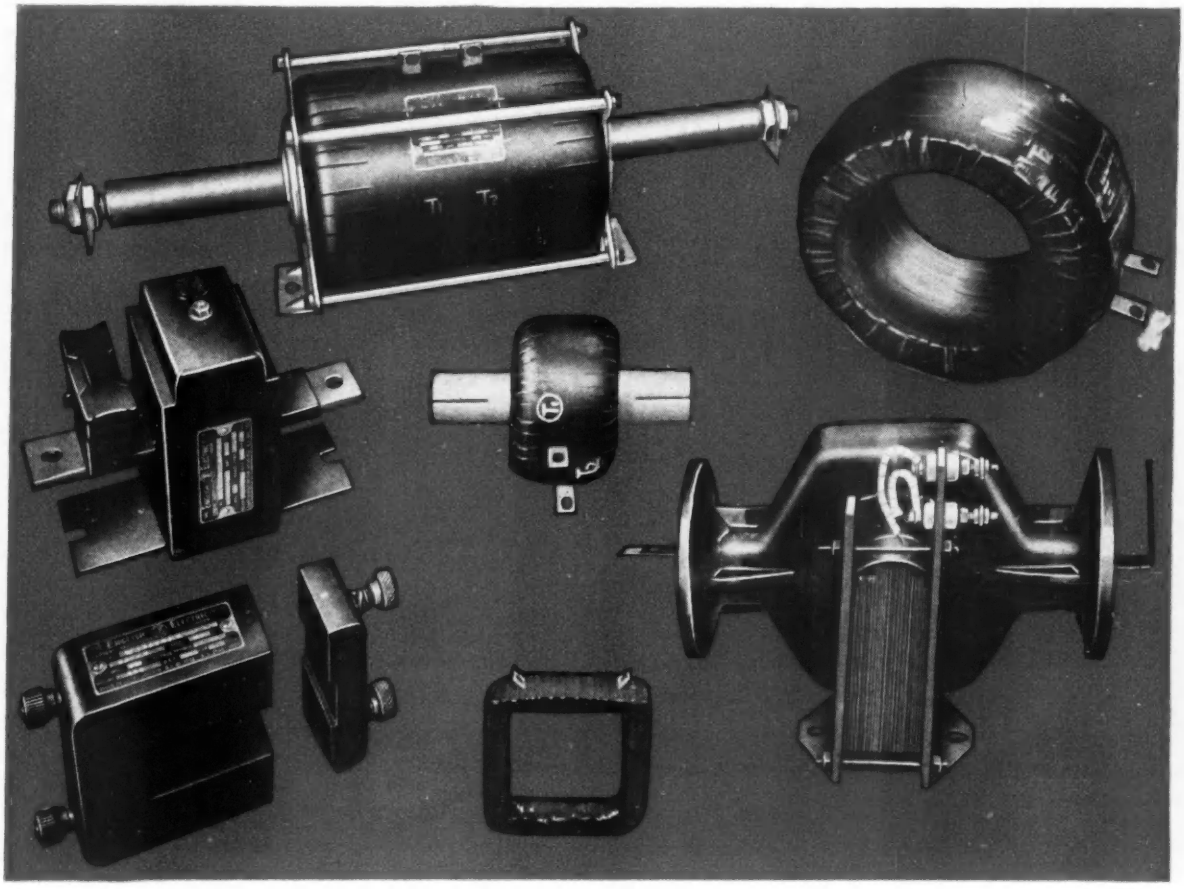

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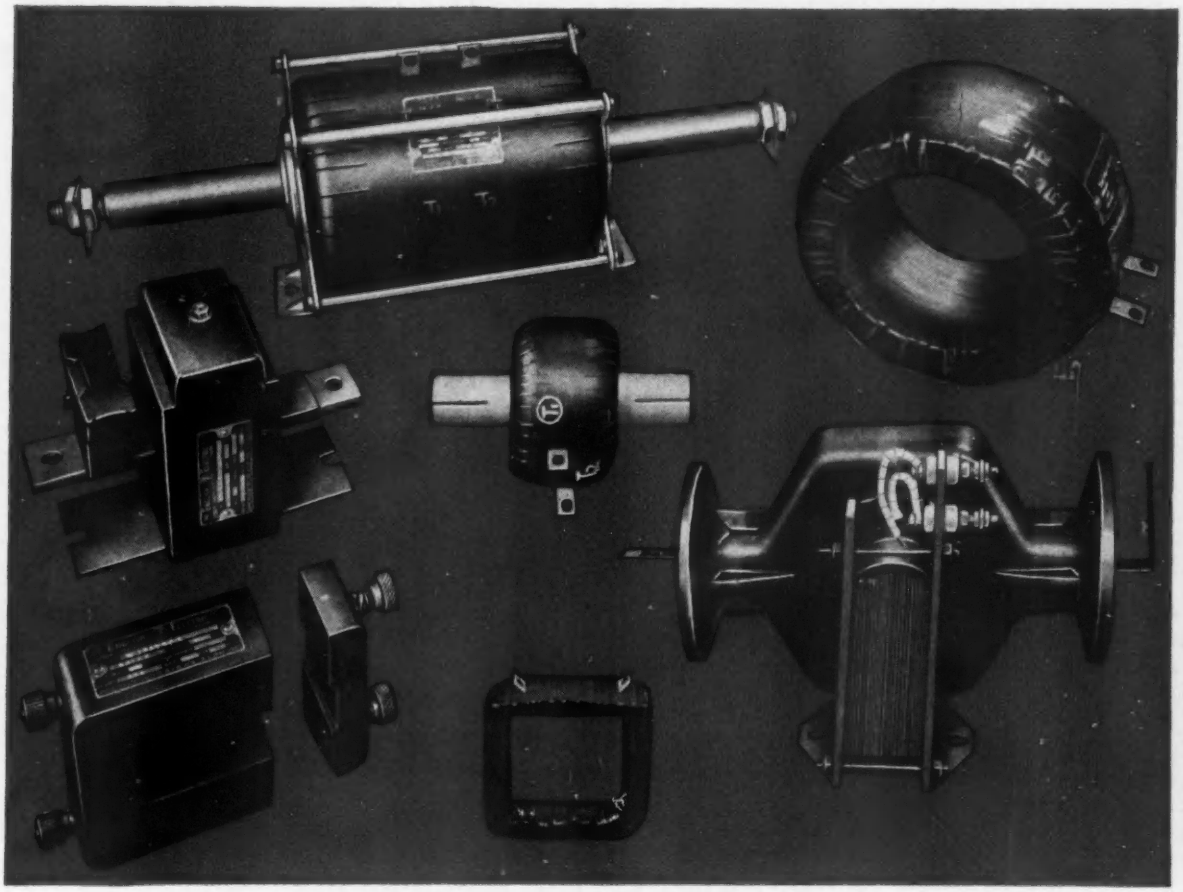

For literature giving details of the range of current transformers, please write to:

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or telephone: AINtree 3641

The English Electric Company Limited, English Electric House, Strand, London, W.C.2.

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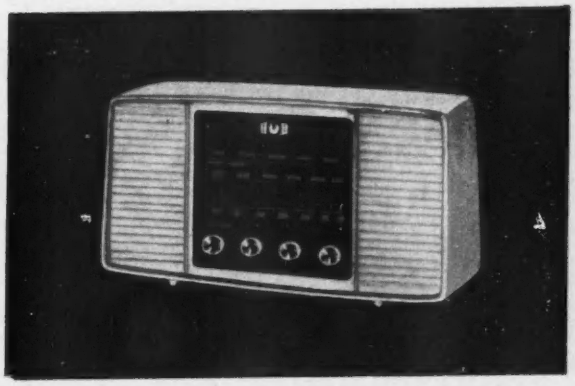

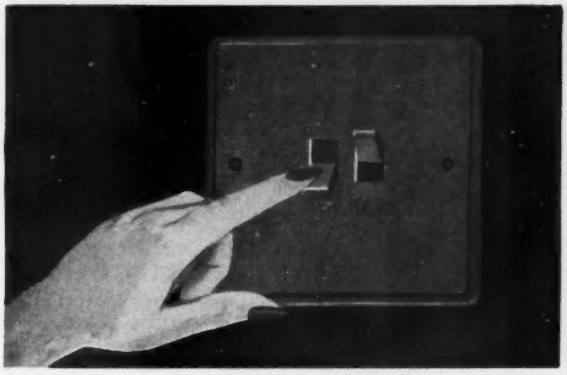

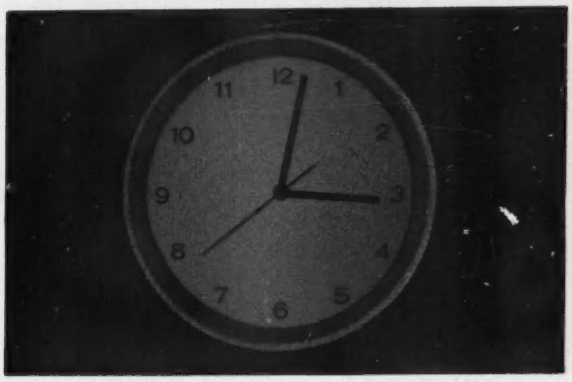

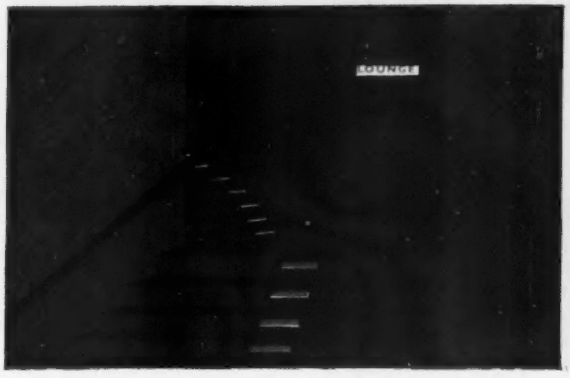

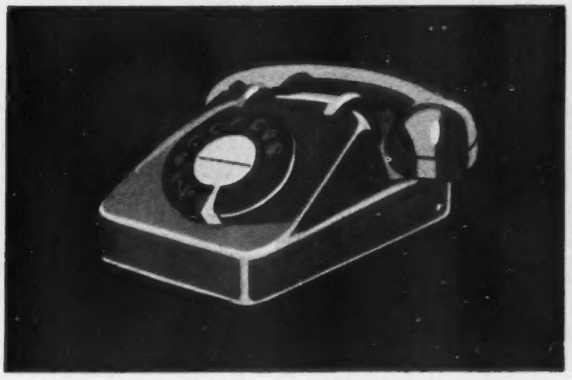

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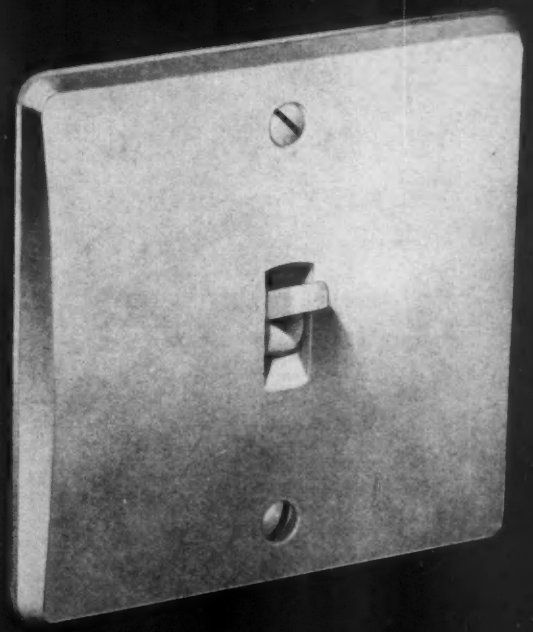

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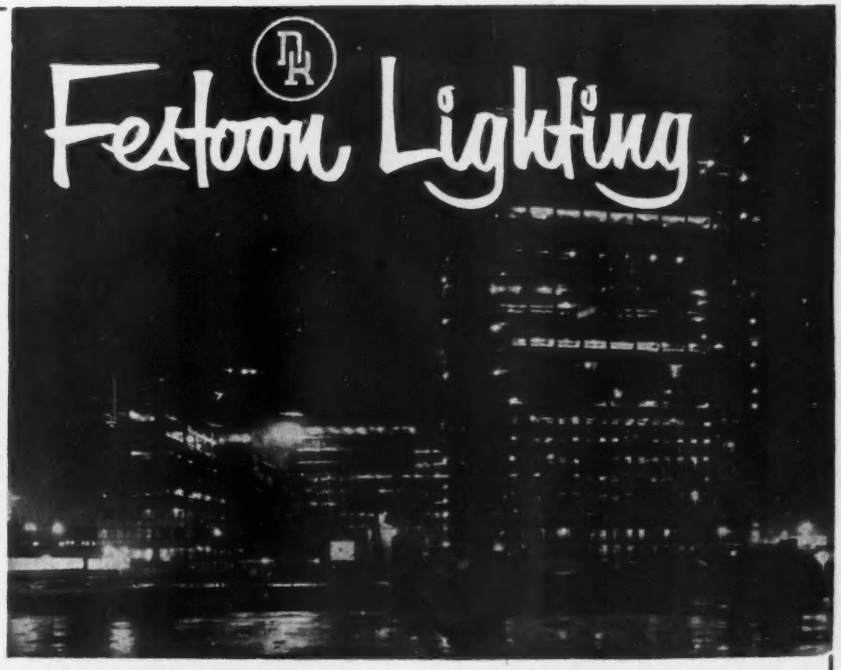

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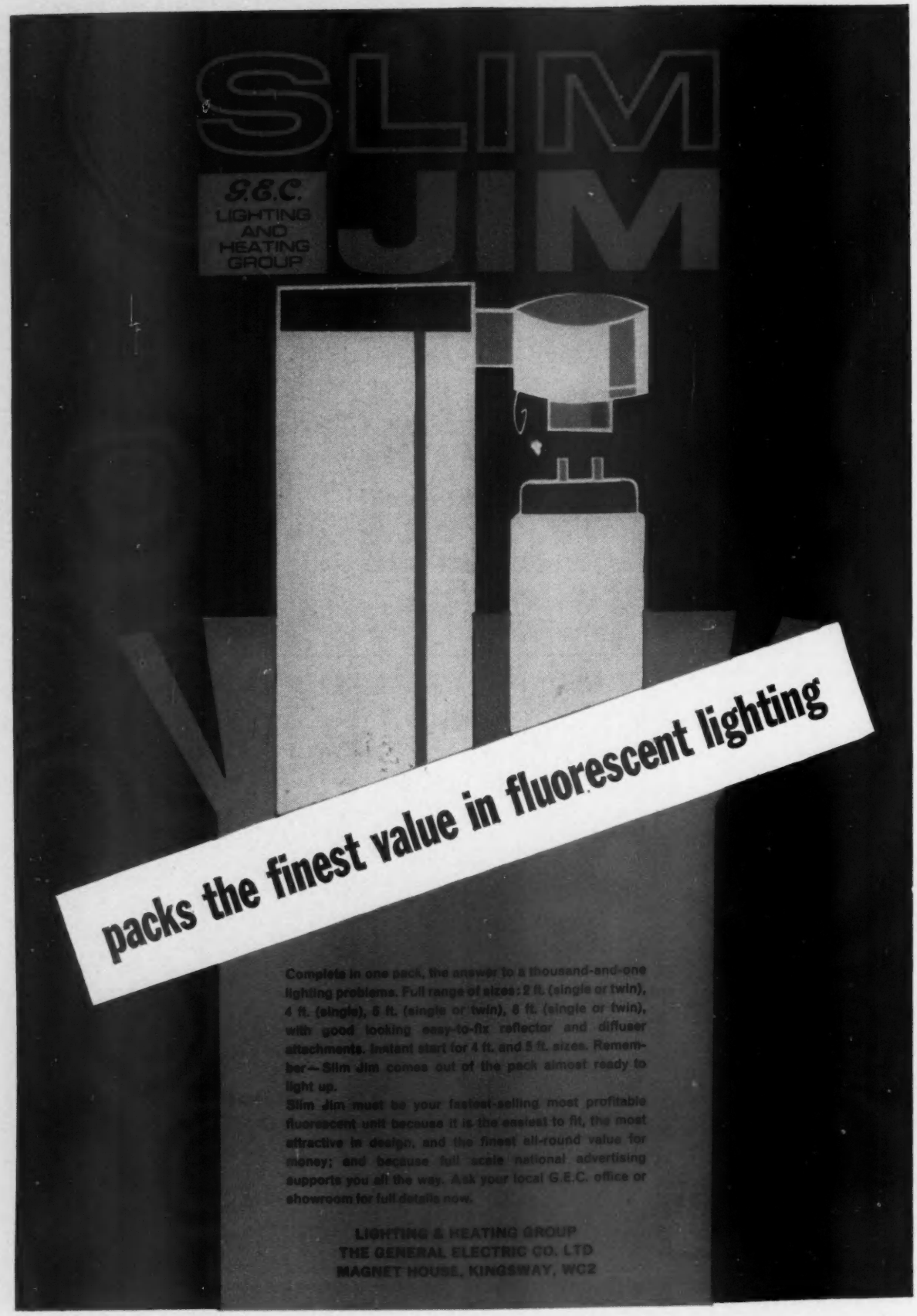
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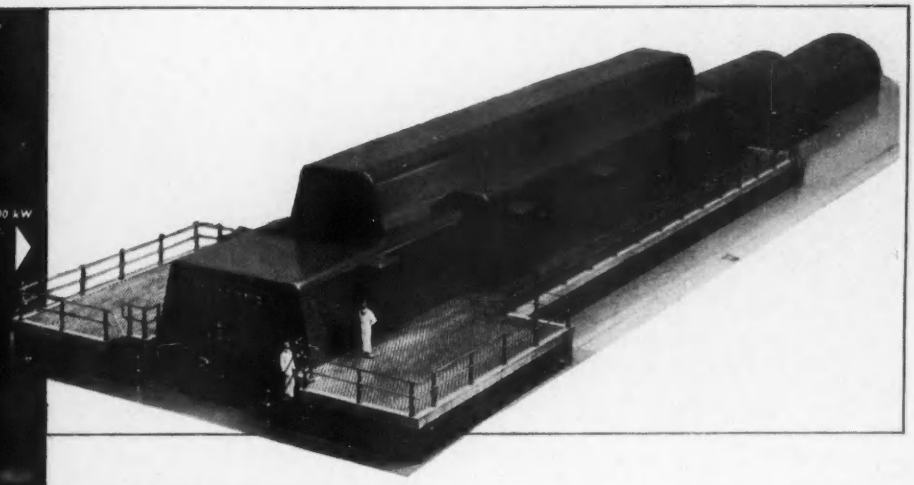
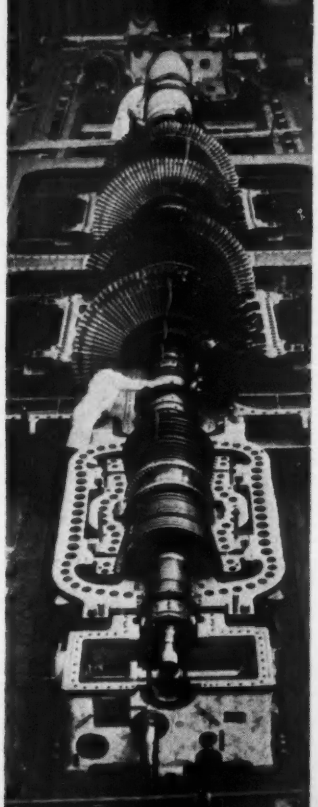


Model of PARSONS 500,000 kW single-line turbo-generator.



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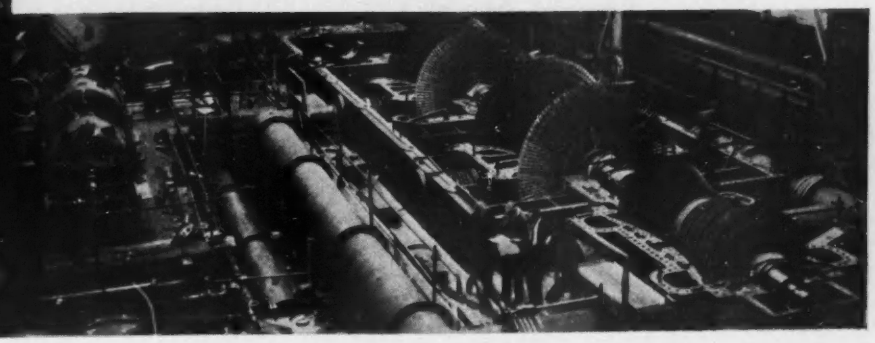

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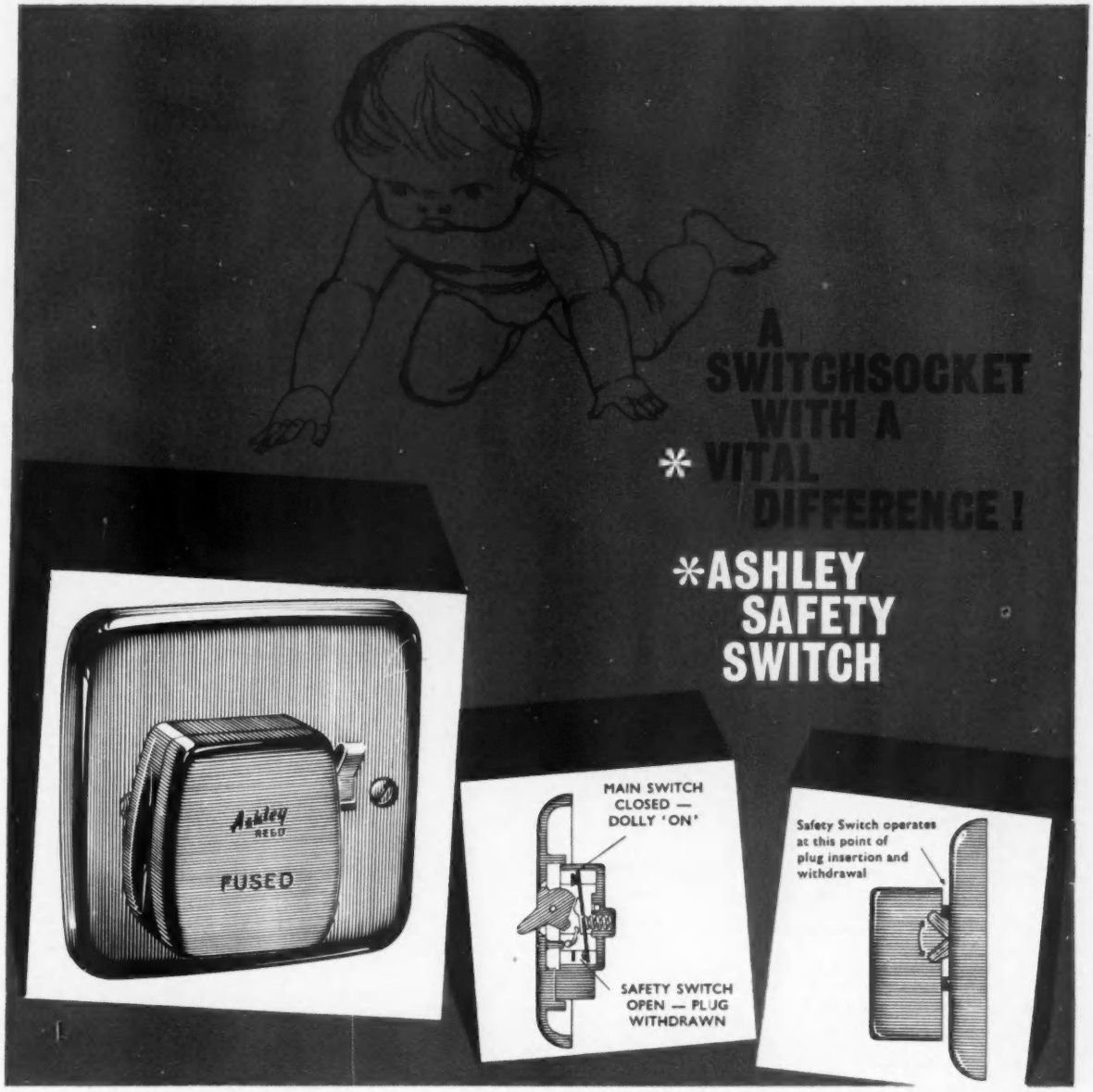
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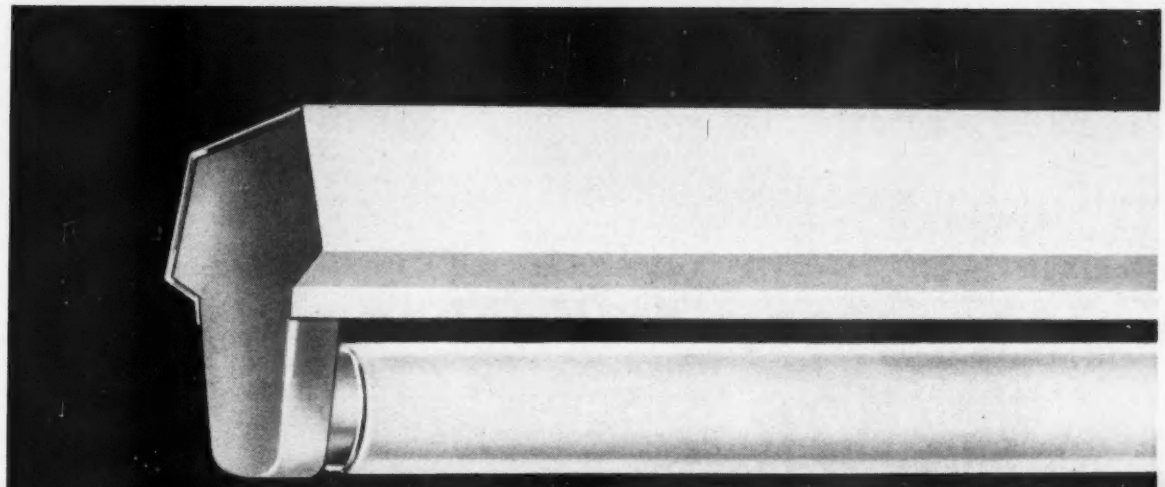

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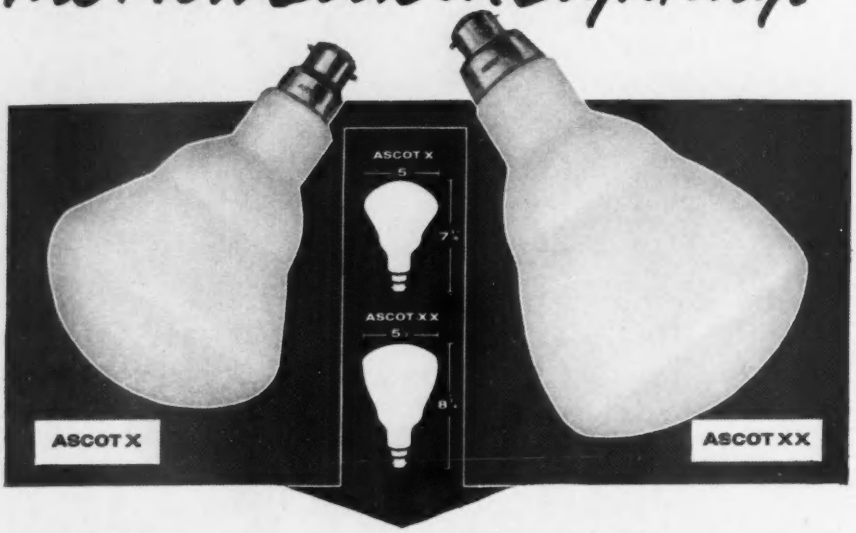

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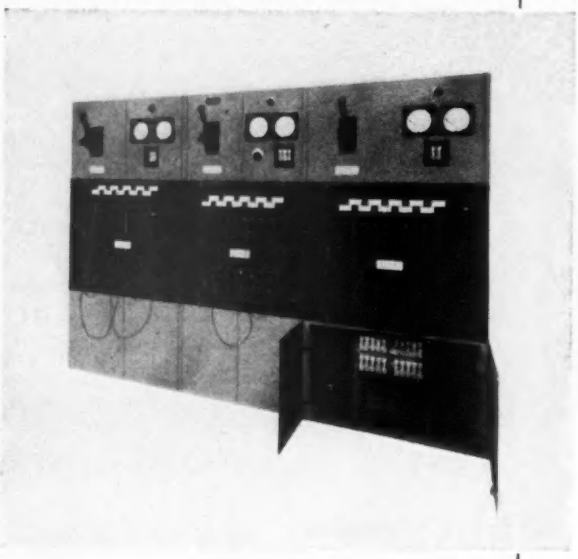

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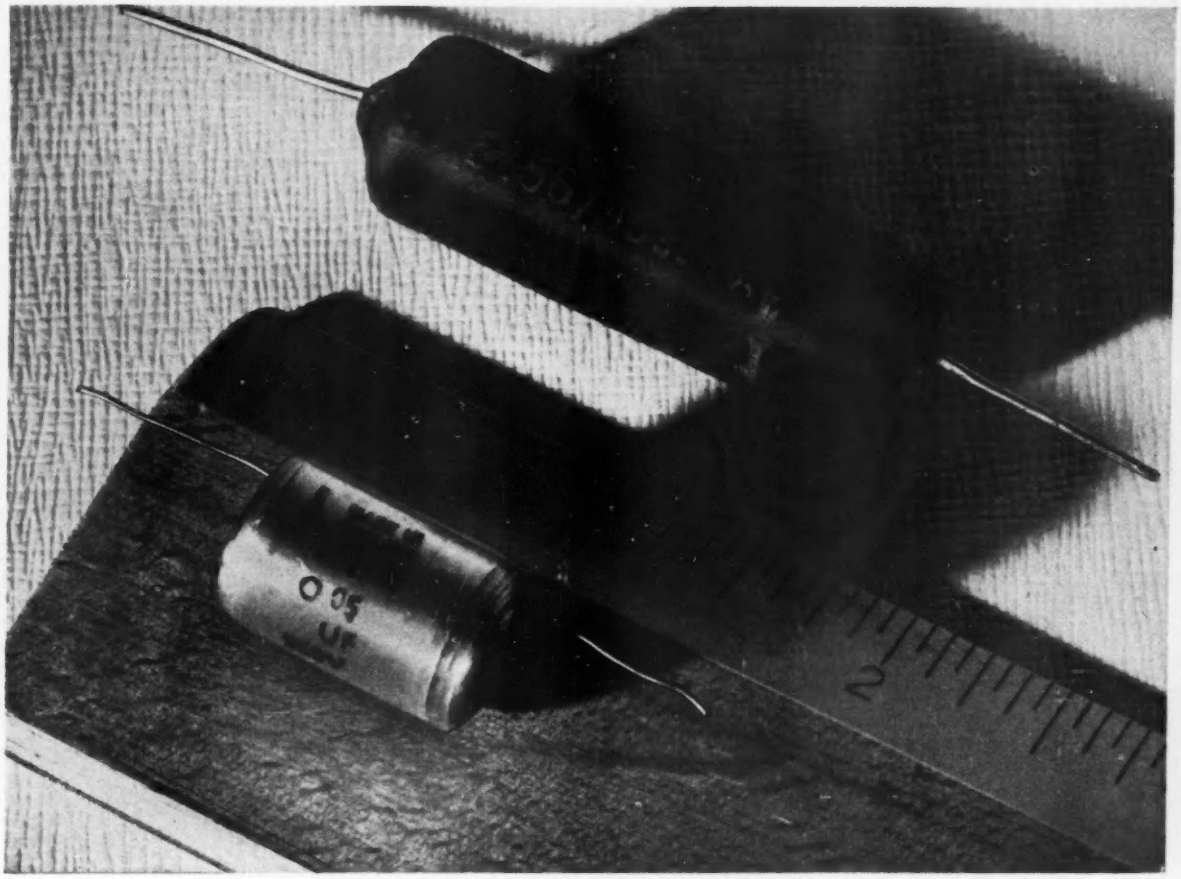

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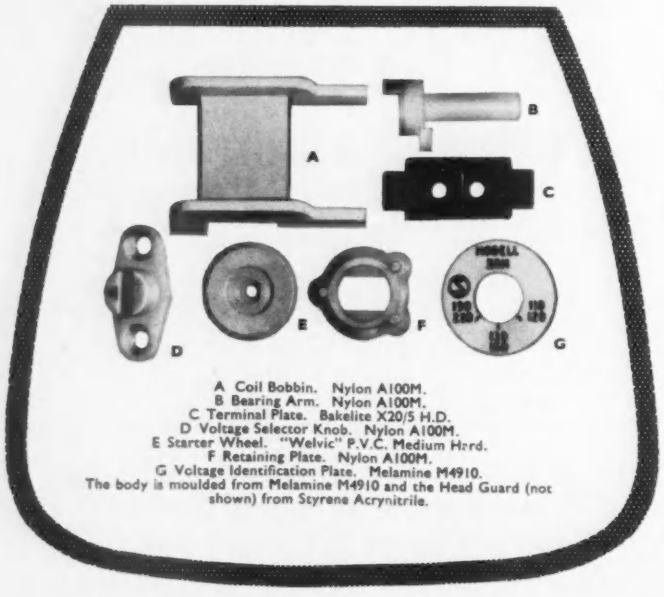

A Coil Bobbin. Nylon A100M.
B Bearing Arm. Nylon A100M.
C Terminal Plate. Bakelite X20/5 H.D.
D Voltage Selector Knob. Nylon A100M.
E Starter Wheel. "Welvic" P.V.C. Medium Hard.
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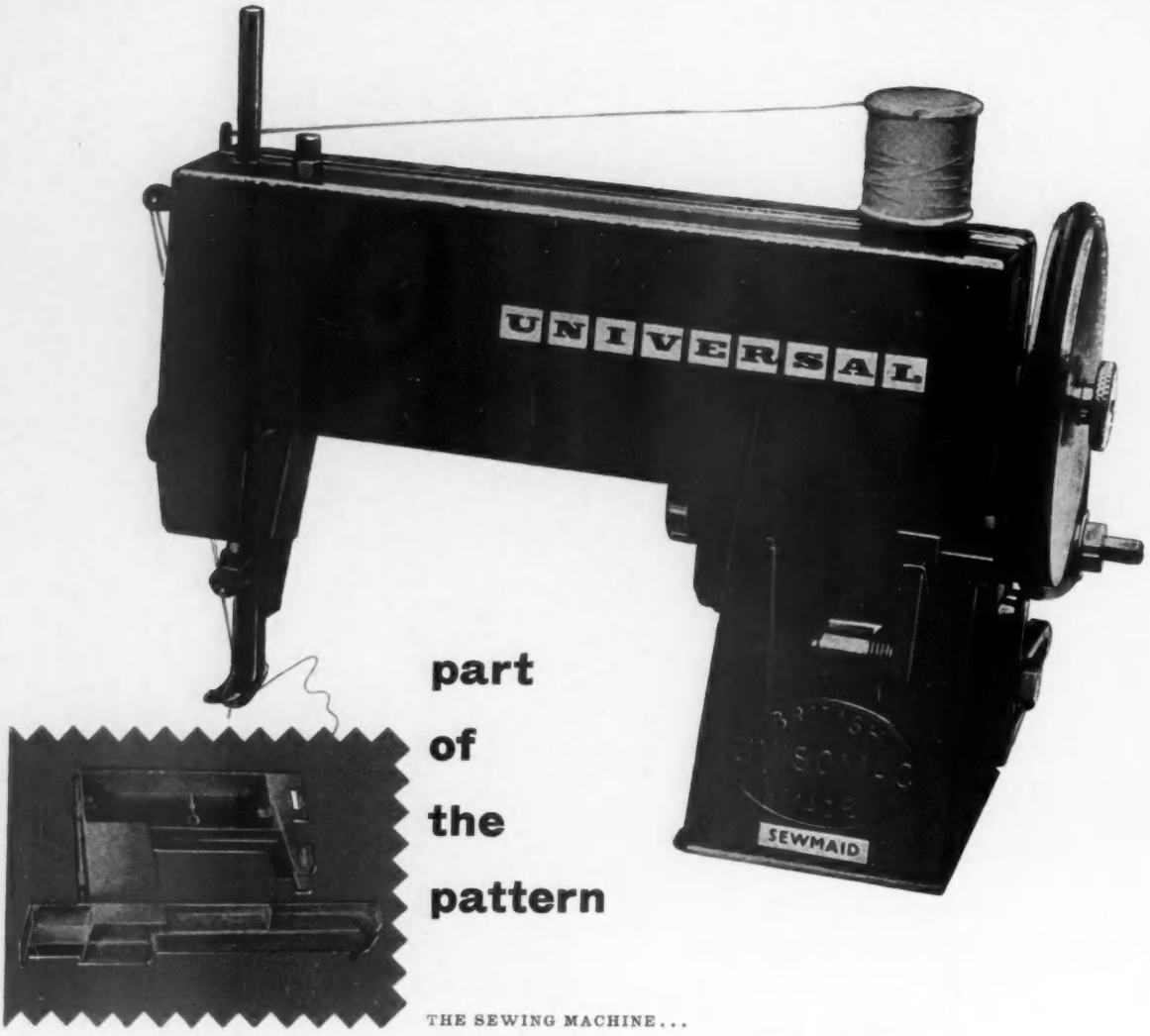
Modelling a harbour installation at the Wave Basin to study the effects of simulated tidal conditions.



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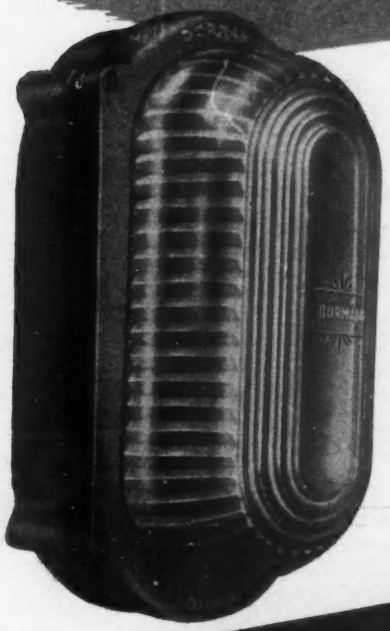

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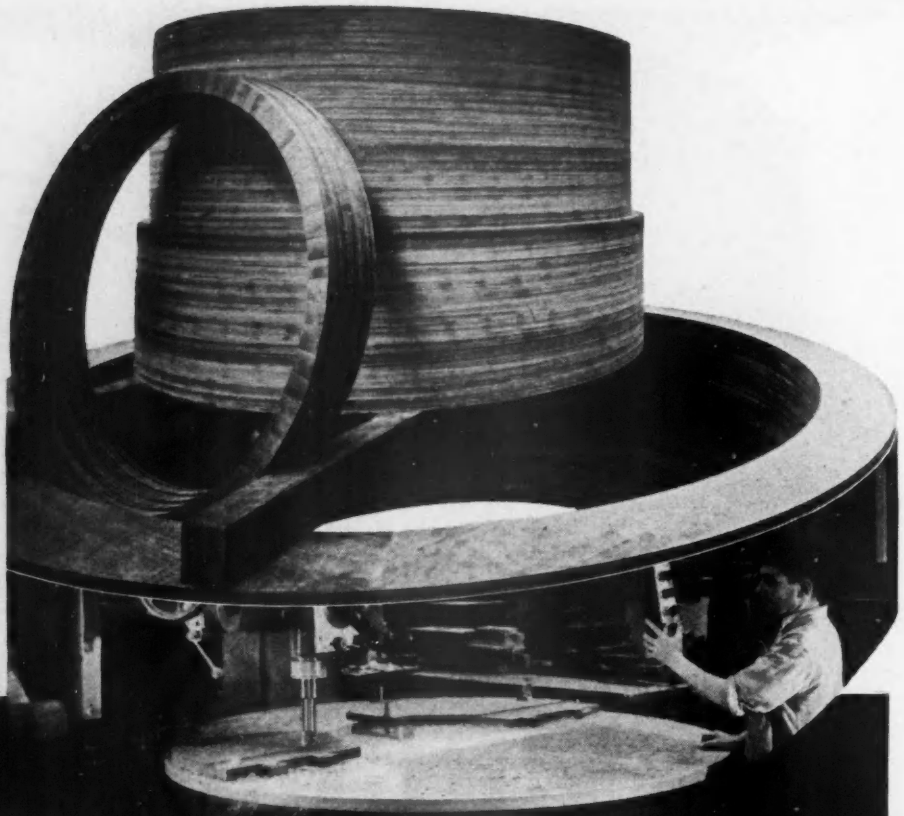

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THURSDAY 9 NOVEMBER, 1961
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ELECTRICAL TIMES

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Dans ce numéro

Eclairage dans les navires 677

Lors de l'étude des installations d'éclairage pour les navires à passagers, la pratique courante consiste à construire des maquettes en vraie grandeur des cabines et des sections des salles communales. Avec l'éclairage à cathode chaude il est difficile de loger l'appareillage de commande. Le manque d'un fil neutre de mise à terre présente des difficultés quant aux lampes de mise en circuit, et peut nécessiter l'adjonction d'un appareillage de commande spécial. L'éclairage à cathode froide présente de nombreux avantages pour les salles communales. Les accessoires d'éclairage pour les navires doivent d'habitude être spécialement étudiés, compte tenu des efforts mécaniques susceptibles de se produire dans les mers agitées.

Modifications du code de câblage 683

Des modifications apportées au code national pour l'installation de câblage (Règlements IEE relatifs à l'équipement électrique des bâtiments) citons l'acceptation du code de couleur vert/jaune pour le conducteur de mise à terre dans les cordons flexibles. D'autre part, on reconnaît l'usage de conducteurs en aluminium comme alternative à celui de conducteurs en cuivre.

Barres omnibus en aluminium 685

Les barres omnibus en aluminium peuvent être fabriquées ayant des raccords d'un fonctionnement sûr à condition que les surfaces, avant qu'elles ne soient boulonnées ensemble, soient nettoyées et enduites d'une graisse ayant une température de fusion très élevée. Il est avantageux de souder les raccords au moyen d'un procédé à gaz inerte, quoiqu'il puisse se produire une certaine perte de résistance mécanique. Dans les cas où le courant est des plus élevés, des cornières ou des barres en aluminium à deux rainures s'avéreraient être les plus résistantes et les plus économiques. Quant aux applications où la tension et le courant sont élevés, on s'intéresse de plus en plus aux barres omnibus de forme tubulaire.

In dieser Nummer

Schiffsbeleuchtung 677

Beim Entwurf der Beleuchtungsanlage eines Passagierdampfers baut man gewöhnlich Modelle von Kabinen und von Teilen der Gemeinschaftsräume in natürlicher Grösse. Bei Glühkatodenbeleuchtung bereitet die Unterbringung der Schaltgeräte gewisse Schwierigkeiten. Das Fehlen eines geerdeten Nulleiters führt zu Schwierigkeiten hinsichtlich des Einschaltens der Lampen und kann Spezialschaltgeräte erforderlich machen. Für Gemeinschaftsräume bietet die Kaltkatodenbeleuchtung zahlreiche Vorteile. Die Beleuchtungskörper erfordern bei Schiffen gewöhnlich Spezialausführungen, wobei die mechanische Beanspruchung bei stürmischer See in Betracht gezogen werden muss.

Abänderungen der Verdrahtungsvorschriften ... 683

Abänderungen der staatlichen Verdrahtungsvorschriften (IEE-Vorschriften für elektrische Anlagen in Gebäuden) umfassen die Anerkennung von grün/gelb als Farbkennzeichung für den Erdleiter in Leitungsschnüren. Ferner werden Aluminiumleiter als eine Alternative zu Kupferleitern anerkannt.

Sammelschienen aus Aluminium 685

Sammelschienen aus Aluminium können mit zuverlässigen Verbindungsstellen versehen werden, falls ihre Oberflächen gereinigt und vor dem Zusammenschrauben mit einem hochschmelzenden Fett eingelassen werden. Das Schweissen der Verbindungsstellen mit Edelgas hat Voreile, obwohl ein gewisser Verlust an mechanischer Festigkeit eintreten kann. Für höchste Strombelastung bilden Doppelnuten- oder Winkelprofile aus Aluminium die stärksten und wirtschaftlichsten Schienen. Für Hochspannungs-Starkstromzwecke interessiert man sich in wachsendem Masse für rohrförmige Sammelschienen.

Lighting for the Ocean Traveller 677
by G. Carter and A. E. Fothergill, DIP.M.I.E.S.

Prime Minister Praises B.E.A.M.A. 682

Wiring Rules Amended 683

Aluminium Busbars 685
by P. J. H. Rata, B.SC.(ENG.), A.C.G.I., GRAD.I.E.E.

Nigerian Supply Progress 688

Europe's Rising Electricity Needs 688

Development of Low-wattage Linear Sodium Lamp ... 693
by K. Scott and R. F. Weston

M.C.B's in Circuit Protection 694

Non-destructive Testing 694

Power Generation in Orbit 701

Historic Beam Engines Retire 701

FEATURES

Readers' Views 684
Around the Trade *by Peregrin* 689
Personalities in the Industry 690
New Literature 692
Standardisation Progress 695
New Products and Appliances 696
Materials for Electrical Design 700
News of the Week 702
Company Activities 708
Overseas News 709
Commercial Information 710

News Sheet 21
Classified Advertisements 47
Index of Advertisers 54

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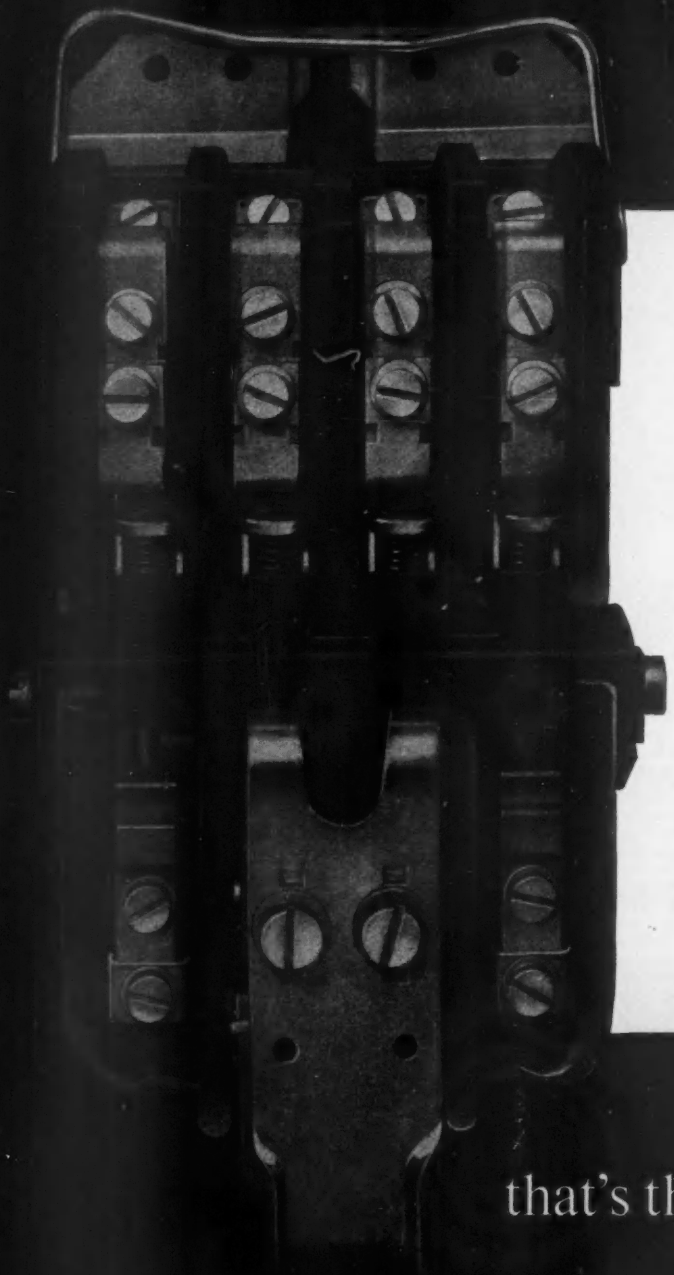

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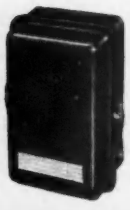

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INSTALLATION EQUIPMENT GROUP

ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 9 NOVEMBER, 1961

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Comment

WIRING CHANGES

At first sight, the changes in the IEE Wiring Regulations imposed by a second list of amendments to the thirteenth edition seem detailed, involving no important principles. In fact, they will mean a lot for the wireman on the job, covering such factors as number coding for cable cores, permissible high-temperature cables, and precautions against corrosion. The principal change is in terms of aluminium. This now achieves explicit recognition as a conductor metal, and its arrival is accompanied by a number of warning notes about the possibilities of corrosion and mechanical weakness. The difficulties about soldering aluminium are recognised, presumably, in a departure from the time-honoured prohibition on fluxes containing corrosive or acidic substances. Altogether, the question of soldering or otherwise jointing aluminium conductors remains something of a mystery. Users show signs of unhappiness about the problem that does not line up with the confidence of manufacturers or the matter of fact approach of Continental engineers, who have been driven to the use of aluminium by material shortages. The IEE Wiring Rules Committee play for safety by permitting aluminium conductors only for sizes larger than 7/·064 in., surely a conservative approach. As we note elsewhere, they also leave a gap in rating tables, so that for some permissible aluminium conductor cables no official current rating is given. That is no doubt a matter that will be resolved during the full revision of the thirteenth edition, now authorised by the Council. In accordance with the long-established policy of the Institution in this respect, suggestions for improvements are being invited from all who use the Regulations, not merely from IEE members. Installation engineers and wiremen should take the opportunity of pointing out any Regulations in which greater clarity would help, as well as cases where there is a technical case for a radical change in requirements.

CHANGING PATTERN OF SUPPLY SPENDING

Government estimates of supply industry spending in 1962-63, noted in our columns last week, throw into relief a factor of importance to the electrical manufacturing industry that is apt to be overlooked. Despite the slowing down of the nuclear programme, the proportion of the supply industry's capital spending that is going to nuclear plant is increasing steadily, and will go on doing so. In the next financial year, about 45% of the money spent by the CEGB on power stations will be for nuclear plant, according to present plans. Last year it was only 34%. The expenditure break-even point is coming close; indeed, if the initial

charge of nuclear fuel is included as part of nuclear station capital costs, it will arrive next year. The White Paper figures are already out of date; the need to increase the amount of plant planned is being discussed with the Ministry of Power and the Treasury. In so far as the result will be something of a "crash" programme, it may raise the proportion of spending on conventional plant, but not for long. For all the programme cuts, nuclear generation is firmly set to become the predominating influence on the manufacturer's home market. At the same time,

CEGB Capital Spending Authorisations—£ million

	1960-61	*1961-62*	*1962-63*
Generation—conventional ...	105·8	99·0	87·0
Generation—nuclear ...	53·5	63·0	70·0
—nuclear fuel ...	2·8	8·8	20·6
Transmission	31·2	39·0	55·0

another trend is showing: devotion of a greater part of the industry's resources to transmission. Again restricting the analysis to CEGB figures for simplicity, whereas last year spending on transmission was about 16% of total plant capital spending, next year it will be 25%. The beginning of major work for 400 kV accounts for this, but once more the pattern of generating planning is likely to keep the proportion well up. Adding on the spending for distribution (with reinforcement work again restricted) and for initial nuclear fuel charges, the electricity industry spending stands to be £397 million next year, out of total approved capital spending by the nationalised industries of £915 million.

HEATING AND COOKING CODE

Publication of Part A1 of BS 3456, reviewed in our pages this week, sets up the pattern for this country's testing of domestic heating and cooking appliances. BS 3456 is prepared for BEAB test and certification procedures, and several parts have been published that are complete in themselves. In future, such parts will give individual requirements for particular appliances, together with any modifications to general requirements in Part A1 that may be necessary. Part A1 has three features of outstanding importance in relationship to the BEAB scheme. The first is incorporation of marking with the BEAB-modified kite mark as an intrinsic requirement. If an appliance does not obtain a BEAB licence it cannot be marked; and if it is not marked, then it cannot be claimed to comply with BS 3456. This is a radical departure from most past standardisation practice. Such provision should do much to boost the status of BEAB in this standards-conscious age. Moreover, it represents a move towards alignment with the continental statutory test organisation; and it is a second significant feature that Part A1 has been based closely on CEE Specification No. 11, at a cost of some compromise about British practice. The third feature bears on a potential weakness of the BEAB certification scheme, the determination to exclude testing of "fitness for purpose." With publication of Part A1, it is possible to judge how broadly the idea of safety has been interpreted; the treatment proves to be very wide indeed. General working quality and ability to stand up to use are covered to an impressive extent. The only complaints in this respect are likely to be about whether too high a standard has been applied, and hence too high a first cost imposed.

LIGHTING SETBACK

The Queen's Speech which opens each Parliamentary session usually indicates some legislation of electrical industry importance. This year there was nothing. What is more, the early exchanges in the House of Commons have indicated that earlier hopes seemed doomed to disappointment. Particularly affected is the lighting side of the industry. The Government seemed committed to bringing in their long-promised Bill to regulate conditions in offices. A private member's Bill which reached the statute book last session provides power for the Government to regulate heating, lighting, ventilation and similar details of offices by making regulations. It had been announced that such regulations would not be made because a more detailed official measure would overtake them. Now the Government's Bill is being delayed until the 1962-63 session. This undoubtedly takes some of the effective sting out of the campaign for better office lighting.

NEW LOOK FOR IEE

IEE members at last week's special general meeting proved ready enough to endorse the proposals for a reorganisation of the meetings and papers side of the Institution's operations. Now that they have given an overwhelming vote in favour of the change, they have to await details that will clothe with flesh the three-division skeleton around which the Institution of the future is to be built. The neat idea of about ten groups within each division may prove too tidy, and it must be hoped that the flexibility of operation which was argued as one of the advantages of the new arrangement will be used in the event. That flexibility extends beyond allocation of subjects, to the position where the committees of the groups are appointed by the divisional committees rather than elected. What will need to be guarded against is any setting of a pattern, so that certain firms or organisations come automatically to obtain a position on the committee of a given group, whether or not they have anyone in a given year interested enough to contribute to the vigour of the corporate life and planning of the group. This will be particularly important where group subjects are such that no obvious leading firm or corporation exists to provide the drive. It is in such rather diffuse-subject groups that interchange of technical information can be most useful and invigorating. There have been failures in this respect in the past. The new pattern for the future gives a chance to retrieve the position.

Meteor

This week's quick summary of electrical news faces advertisement page 20

Lighting for the ocean traveller

CREATING THE "ASHORE" ATMOSPHERE WHILE AFLOAT

by G. Carter and A. E. Fothergill, Dip.M.I.E.S.*

THERE is, perhaps, no lighting installation which offers greater opportunity to the imaginative lighting engineer than that of a first-class, ocean-going passenger liner. Nor is there one which presents such a challenge to his inventive abilities.

Of the many industries which require a large range of specialised skills, probably the building of a ship is among the most demanding; yet it has been said that ocean-going liners are little more than floating hotels. But how many hotels will experience such wide and rapid changes of climate, need to cater for the tastes of nationals from every country, be entirely self-sufficient for days, or even weeks, on end while continuously generating its own power for all services and, at the same time, propelling itself across the oceans of the world.

It is a formidable proposition requiring the services of many professions, not least among whom are the interior designers, for it is their work which probably influences the comfort of the passengers more noticeably than any other and upon which much of the popularity of a vessel may depend. The architect or designer may have some brief from the shipowners, and he may seek to learn from them of their experience of passenger requirements on other vessels of their fleet, but he has to face a problem of interior design which is not paralleled in any other form.

The modern passenger vessel is, in one respect, little different from present-day buildings ashore. The constant demand for greater accommodation means, on board ship, more decks so that the architect is now presented with areas to decorate, perhaps accommodating several hundred passengers, but with ceiling heights only comparable to those found in domestic dwellings. Occasionally he may be lucky enough to find a particular space rising through two decks and his scope is considerably improved but this is the exception rather than the rule. While every consideration is given to comfort of passengers, payload is the important factor which cannot be overlooked.

Planning

Nearly all interior designers now regard the lighting as an integral part of their décor; the days when it was an afterthought are, fortunately, now departing. Consultations take place as soon as embryo schemes are laid on paper or, alternatively, the lighting engineer and designer may be called upon to submit lighting schemes. With some experienced architects, it may be merely a matter of checking and commenting upon a fairly detailed plan but, once the general form is agreed, the design of lighting fittings, construction of coves and other details must be pursued.

All this, however, takes place many months in advance of the completion of the vessel. It is usual to construct "sample" cabins, sometimes several sets furnished and illuminated in different ways, from which the shipowner makes his selection. The "sample" cabins for the latest P. & O. liner *Canberra* were constructed more than three years before its maiden voyage. While minor alterations were, naturally, unavoidable, the final installations were fundamentally unchanged.

Fig. 1. Ashore or afloat? This private dining-room for small parties on the "Windsor Castle" might well be in a first-class hotel or restaurant

The work of designing the interior and lighting proceeds gradually over the months and alterations are made as positions of other services become known, or where the architect has "second thoughts." The shipbuilder must be kept fully informed throughout so that all cables, switches, fuses, etc., for the various circuits are ready and awaiting the lighting fittings and equipment. Contractors responsible for decorations, etc., must also be advised on electrical runs and terminations so that they can provide suitable "grounds" in their woodwork for fixing lighting fittings. They are usually provided with full-size detail drawings of the fittings as soon as these have been approved by the interior designer. Meetings take place regularly to iron out difficulties as they arise and, occasionally, shipbuilder, contractor, architect, lighting engineer and designer meet to finalise details to mutual satisfaction.

On occasions it may be necessary to "prove" a method or system of lighting, and mock-ups of lighting features are erected for architects' or shipowners' approval.

Lighting for Atmosphere

There are other considerations for the architect. Some spaces near the water line may have little or no natural light. The vessel may at one time be in the North Atlantic waters and a few weeks later cruising in the Mediterranean. The public rooms must therefore be warm and inviting or cool and restful according to whether it be in colder waters or in the tropics. While purely physical comfort

* Lighting Division, GEC.

can be taken care of by air-conditioning, there is a limit to that which can be done to psychological comfort with furnishings or colours. But considerable help can be afforded by the lighting.

Since natural light is available to only a limited extent on shipboard, architects have been conscious, for some years, of the necessity for artificial light as an ancillary to their décor, but more recently there has been greater appreciation of how it can be used *as an integral part* of their decorative schemes.

Bright, sunny interiors for breakfast; soft lights and shadows for dinner. These have been major features of restaurant lighting on recent vessels. The illusion of sunlight and contact with the outside world can be effectively created by artificial windows illuminated from behind with hot- or cold-cathode tubes. For dinner, curtains drawn across these windows provide a completely contrasting atmosphere and suggest the advent of evening shadows. The intimate atmosphere is further enhanced by a general lowering in the overall level of illumination. Some or all of the fluorescent tubes can be either switched off or dimmed; tungsten filament lamps may be introduced in deckhead fittings or in decorative table standards and, of course, the shades of colour in the fabrics and furnishings themselves undergo subtle changes with the different colour-rendering properties of the light sources. In this role of creating an atmosphere which is readily changeable, lighting is a most useful tool to the interior designer.

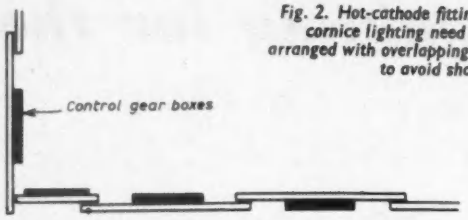


Fig. 2. Hot-cathode fittings in cornice lighting need to be arranged with overlapping ends to avoid shadows

Fluorescent Lighting

In the post-war years, greater use has been made of fluorescent lighting, a logical development since, for a given level of illumination, less power is consumed than for tungsten filament lighting which is a big advantage for a "floating city" unable to draw on any external power system. However, there has been a general raising of illumination levels, particularly in crew accommodation, new Board of Trade regulations covering these areas having been introduced in January, 1954. As a consequence, the use of hot-cathode fluorescent lighting in passenger and crews' quarters is now almost universal, tungsten filament fittings being used purely for local or emergency lighting.

Much has already been written on the advantages and merits of hot- and cold-cathode lighting aboard ship and it is not proposed to go into detail here. It is, however, worth-while to record that, following successful sea trials in a coastal vessel in 1936, the first cold-cathode lighting installation aboard ship was carried out on the *Oranje* in 1937 and it is still functioning satisfactorily.

In the early post-war years many large installations were made in the public rooms of liners then being reconditioned after serving as troopers, hospital ships, etc. Among these were the *Empress of Scotland* (previously *Empress of Japan*), and the *Queen of Bermuda*. The P. & O. explored and compared the possibilities of both types of fluorescent lighting in their new post-war vessels *Iberia* and *Arcadia* and the experience gained was undoubtedly a factor in the decision to adopt cold-cathode lighting for the new and revolutionary *Canberra*.

Canadian Pacific have also used cold-cathode lighting on all the new "Empresses." Union Castle Line employed cold-cathode lighting in the first-class spaces on the flagship *Windsor Castle*, with hot-cathode lighting in the tourist spaces. In their latest vessel, *Transvaal Castle*, the main public room lighting will again be cold-cathode, so it can truthfully be said that, in so far as public rooms are concerned, the subsequent development of the hot-cathode fluorescent tube has not led to a significant decline in the popularity of cold-cathode lighting aboard ship.

Hot-cathode Installations

Hot-cathode fluorescent tubes are used extensively throughout all areas of modern passenger liners. The shorter 18 in. and 24 in. sizes are more generally used in accommodation areas. Single and twin tubes in ceiling fittings are commonly used for general lighting in cabins, while the longer tubes are to be found in machinery or other working spaces and in public rooms. There is, however, no firm line of demarcation. In passenger cabins, 18 in. tubes or shorter may be used as supplementary mirror lighting above toilet cabinets or in dressing tables.

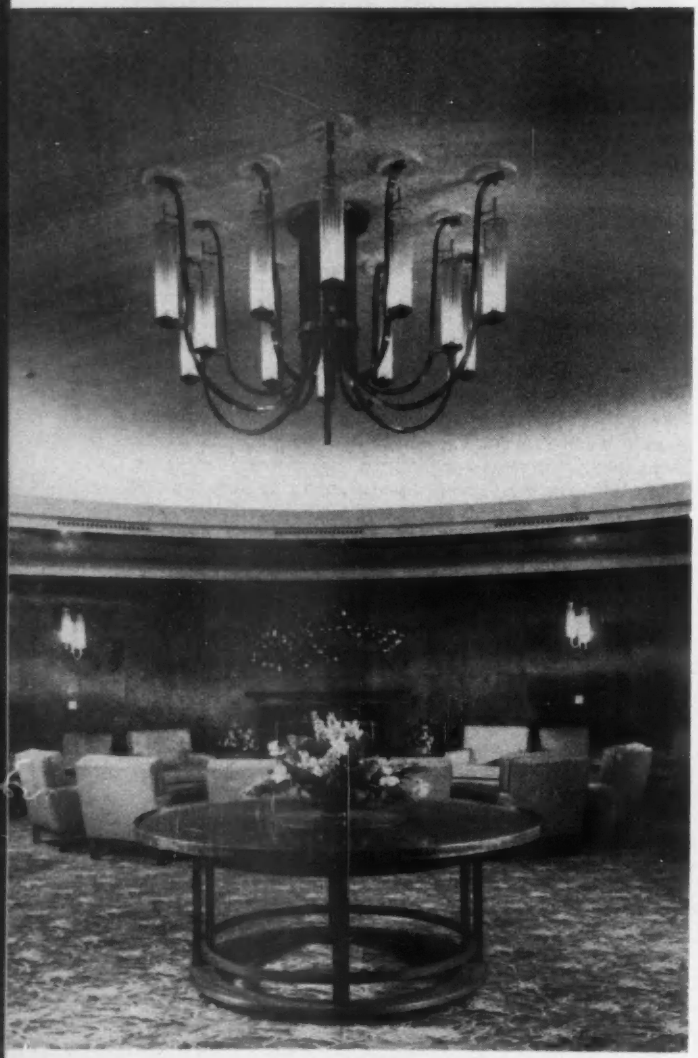


Fig. 3. One thing alone betrays this lounge as seaborne; the anchorages to the ceiling pendant fitting which otherwise would sway in heavy seas But here the designer has married his art and functionalism perfectly

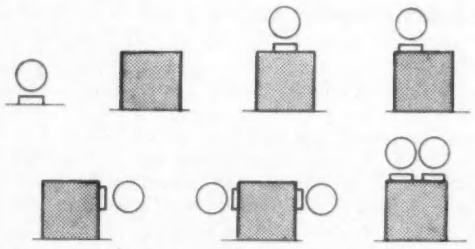


Fig. 4. Six arrangements of tube and control gear for cornice lighting. In each case the dark block represents the control gear and is separate in the first instance

Individual ceiling fittings in public rooms tend to be decorative and tubes are also used more functionally for murals or map illumination. A variation to be found in the table tennis room on the *Oriana* has louvres finished matt black to avoid reflections which would distract the players, and the lighting load is balanced over the three phases of the supply.

The *Oriana* also provides a classical example of large-scale use of hot-cathode tubes for indirect lighting in rectangular coves or straight runs. The principle of overlapping the ends of the tubes is used to avoid shadows or brightness variations being apparent at the back of coves, a system established on earlier vessels. Although there are optimum limits for overlapping, it is a fairly flexible arrangement which can be applied to coves of any length. There is, however, one proviso. It may not generally be realised that it is possible to do this with only two sizes of tube, 4 ft 40 W and 2 ft 20 W, *not* 2 ft 40 W since the twofold increase in power/ft length is quite apparent. In fact, the whole of the P. & O. liner *Iberia* hot-cathode indirect lighting installation was carried out with these two tubes (Fig. 2).

Possibly the greatest difficulty with this form of lighting is the housing of control gear. With almost one set for each tube, the total bulk can be formidable. In some cases, if the cove is large enough, the control gear can be accommodated there but, in other circumstances, provision has to be made for concealing the equipment somewhere close to the tubes. This usually means removable ceiling or wall panels to provide access to the control gear. It also involves extra wiring for the shipbuilder for he has to complete the connections between tubes and control gear.

Much of the installation on the *Oriana* was carried out in this way but, where the coves were sufficiently large, complete units comprising tube, spine and gear boxes were installed. Incidentally, this vessel probably has the largest hot-cathode installation of any sea-going vessel, covering all types of lighting fittings, both a.c. and d.c.

Another problem arises from the fact that the ship's a.c. supply is not the standard 230/400 V, three-phase, four-wire system with earthed neutral found ashore. On board ship the lighting load is usually connected in delta across the 230 V to 240 V phases of lighting transformers isolating them from the main system or from motor-alternators. Though either may be star-wound, if the neutral is not earthed the system is, in effect, a delta. These arrangements do not unduly affect the performance of switch-start, hot-cathode control gear but, in the case of instant-start gear, standard equipment will not function consistently. The instant-start circuit is growing in popularity since the tube is the only expendable item which makes for easier maintenance. But, with reduced or no potential between the cathode and the metal strip on the tube, starting is not so consistent as in shore installations. Bearing in mind that, at times, the vessel may sail in near-arctic conditions as well as in tropical and that not all fittings are in air-conditioned rooms, it is not unusual to find the specification calling for reliable starting within certain limits of temperature and humidity at reduced supply voltage. In addition, vessels with a 60 c/s system may require the control gear to operate reliably at a reduced voltage on 50 c/s, so that a shore supply of this frequency can be used when in port. Invariably, these requirements can only be met with special control gear.

For d.c. circuits, the ballast can be either in the form of a tungsten filament lamp, stabilising valve or a wire-wound resistance. If the latter is to be incorporated in the fitting, provision must be made for the dissipation of the heat generated. Polarity reversal is not usually necessary on d.c. with short tubes in totally enclosed fittings. If the fittings, however, are positioned where they are subject to cold draughts, i.e., in corridors, open decks and in machinery spaces where there are many fresh-air inlets, or if 4 ft and 5 ft tubes are used, it is prudent to make arrangements for polarity reversal.

Fig. 5. The lighting treatment of the ballroom on the "Empress of Canada" has been considerably facilitated by the additional height afforded by two-deck construction. In equipment it equals any ashore

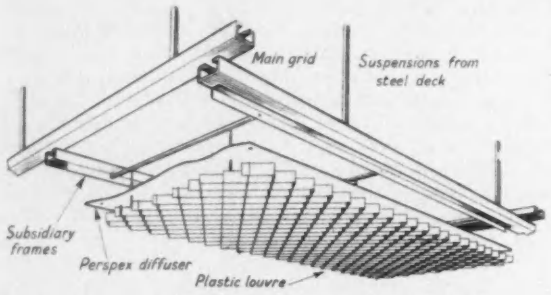


Fig. 6. A form of luminous ceiling incorporating both diffuser and louvre panels showing constructional details

Cold-cathode Installations

The main advantages of this form of lighting for ship interiors are as follows:

(1) Extremely long and trouble-free life; correctly installed, the tubing will last several years. The need to reduce maintenance to a minimum aboard ship need hardly be emphasised, particularly where the vessel is at sea for long periods.

(2) Tubes can be shaped and curved to any contour; consequently, lighting features and architectural forms need not be bound by straight lines.

(3) Electrodes can be turned back parallel to the main run so giving a continuous unbroken line of light, particularly around corners.

(4) The range of available tube colours is wide.

The luminous efficiency, though not so high as that for hot-cathode tubes, is higher than tungsten filament.

As a general rule tubes are made in basic lengths, and these are used with great ingenuity throughout the vessel. By reducing the number to a minimum, the spares problem is eased.

In the early stages of planning the number of transformers can be estimated from scale drawings. Positions for these are agreed so that the builders can weld fixing brackets in position and the decoration contractors can make arrangements for suitable access panels. Transformers are of special marine pattern designed and rated in accordance with Lloyd's rules. The terminal chamber is at one end and top access is not required. High-voltage cables are kept as short as possible and run from the transformer to the nearest electrode box. The cable entry is normally at the ends of the box but, if these should not be easily accessible with the box in position, other arrangements can be made. The decoration contractors are usually most co-operative and provide full setting-out details at an early stage but, such are the demands on space, it does occasionally happen that ventilating trunking or some other services appear just where it was intended the cold-cathode tubing, electrode box, or transformer should be. It is, therefore, clear that co-ordinated planning between all parties must be commenced at an early date and must also be closely maintained until completion.

Tungsten Filament Lighting

It might be assumed from the foregoing that the tungsten filament lamp has little or no place in lighting aboard ship. The size and the compactness of the tungsten filament lamp make it the preferable source for purely decorative fittings. Moreover, the smallness of the filament is ideal for reflector systems highlighting special features, etc. Critical optical control can be achieved by the use of low-voltage spotlights, which have been used with effect on both the *Oriana* and *Canberra*. Lighting of public spaces is rarely by fluorescent tubes alone. Decorative tungsten filament fittings supplement the main lighting and a proportion of these are on emergency circuits.

Design of Fittings

Lighting fittings take many forms. They may be decorative, purely functional, or both, sometimes being called upon to fulfil a particular function without themselves being seen. They may house any light source, tungsten filament, hot- or cold-cathode. The design of these, particularly where aesthetic consideration must be given, is a matter for consultation with the architect. Sometimes he determines the general appearance; more usually, he leaves it to the designer to submit proposals.

Whatever form the fittings may take, wall brackets, laylight or even a long run of glazed cornice, the designer is faced with problems which are peculiar to ships. It may not generally be realised that, as a ship moves, so the whole of its frame flexes, the flexure increasing as the weather roughens. This flexure is supplemented by continuous vibration, un-noticed, perhaps, by the traveller sitting in a comfortable chair or standing upon a luxurious carpet, but transmitted nevertheless to every fixture, lighting or otherwise.

Lighting fittings, or any part of a lighting installation, must comply with Lloyd's regulations or any other international societies' rules. The shipbuilder may have his own requirements and specify cable entries to accommodate as many as nine 3/·029 cables, each of which is a little over $\frac{1}{4}$ in. dia. Provision has to be made for adequate fixing and freedom from rattle and for lamp replacement.

Almost invariably the fittings must be of a special design for, apart from the need to marry into the decora-

Fig. 7. The card room of the earlier "Empress of Britain." A design of the 'twenties before fluorescent lighting was developed and typical of lighting fittings and decor of that period

tive scheme, it is seldom that the normal lighting fitting held in manufacturers' stocks would meet the requirements of a ship's installation. This does not mean that the fittings must be excessively heavy; indeed, shipbuilders are becoming almost as weight-conscious as aircraft builders. With increasing use of aluminium in superstructure, it is also being chosen for lighting fittings. This brings fresh problems, particularly in regard to finish and corrosion.

No two vessels are alike, and types of fittings vary widely. Traditionally, they are of robust construction, using non-ferrous metals of various types in elegant patterns requiring great craftsmanship in manufacture. Their design calls for a sound knowledge of materials, an imaginative mind and considerable experience of shipboard conditions.

Pendant Fittings

Pendant fittings are always a problem. The modern idiom demands a few slim metal tubes almost inconspicuously supporting the glassware, with a single central fixing. Normal enough on land, they are not easy to design for ships. Even the most modern passenger vessels equipped with stabilisers can still be moved sufficiently violently to place strain upon such fittings. The danger of breaking free from attachments, distortion or fracture of metalwork or merely breaking of the glassware is by no means negligible. To design a pendant which is elegant and at the same time neither so light that it might be unsafe or so heavy that it is anything but graceful, requires more than a little thought. The pendant fitting and matching wall brackets in the Mayfair Room on the *Empress of Canada* are good examples (Fig. 3).

Floor standards are strengthened by the use of steel tubes welded or securely fixed to cast baseplates, all concealed within the wood or decorative metalwork. Even this may not be sufficient to prevent whip at the top and a wall fixing is usually incorporated.

The fundamental problem with hot-cathode fittings is concealment of the control gear already mentioned. Although elaborate bronze and glass decorative features have been common enough in older vessels, the modern tendency is for sheet metal structures with plastics diffusers.

Cold-cathode tubes are not only used for concealed lighting. They also figure in larger fittings or the whole or a part of a ceiling may use them above plastics louvres or other diffusing features (Fig. 6). The installation and maintenance of louvred or luminous ceilings requires consideration in many aspects. Problems include the avoidance of any vibration rattle, the provision of positive fixings which still make panels easily removable, etc.

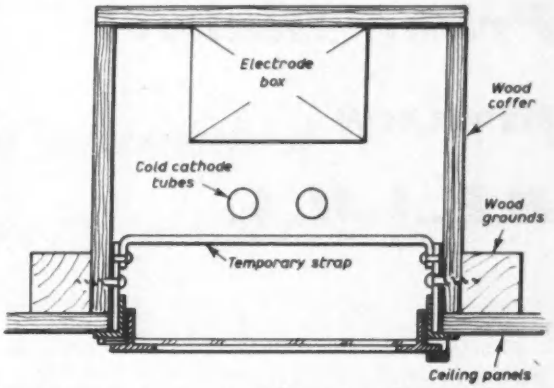


Fig. 9. Section through a typical cold-cathode lighting fitting showing temporary strap for reinforcement while transporting and erecting

Cold-cathode lighting is also employed in laylights of various lengths and widths. Hinged doors used for access to the tubing, generally not exceeding about 5 ft, are subdivided by glazing bars, depending upon the width of the frame, to ensure that no area of glass is excessively large. Because of the standardisation in length of cold-cathode tubes, already mentioned, and that in any event a number of laylights may vary considerably in length, it seldom happens that the ends of the doors and tubes coincide. It is, therefore, necessary for laylights, regardless of length, to be so designed as to open without obstruction to the tubes for their entire length. This prohibits any fixed parts of the framework across the fitting and, on long fittings, the omission of cross members to the framework creates an inherently weak structure until it is erected. The frames are therefore fitted with temporary stretchers for transport and erection which are removed when the fittings are in position (Fig. 9).

Fig. 8. By contrast with Fig. 7, the card room of the modern "Empress of Britain" which, despite the low ceiling height, gives better sense of space by modern lighting and decor

Conclusion

Only a few aspects of lighting on ships have been mentioned and mainly those which have arisen on vessels coming into service during the last few years. All have presented problems peculiar to themselves even though many practices are so well established as to be almost "rule of thumb." But there are further developments on the horizon. Flat fluorescent panels will afford the designer greater freedom of shape for the lighting fittings and a new tool for the lighting engineer. Transistorised operation of fluorescent lamps is well established and has already been used. So long as such advances are being made, each new vessel brings fresh interest and a challenge to both lighting engineers and designers.

Prime Minister praises B.E.A.M.A.

LORD CHANDOS' PLEA FOR STABLE GOVERNMENT POLICY

A SIGNAL honour was accorded BEAMA last week when the Prime Minister, the Rt Hon Harold Macmillan, was the principal guest at its golden jubilee dinner. At this distinguished gathering, the president, Mr A. M. Browne, was in the chair.

In proposing the toast of "The Industry," the Prime Minister pointed out that the doubling of output of electricity every decade was more than Mr Butler had ever prophesied. Further, unlike everything else, the cost of power stations was continuing to fall. The industry had a fine record for research and was vigorous and forward looking but we must make a pragmatic approach to our problems and cannot be hidebound by theory. The Chancellor's new planning proposals had been well received by industry and the trade unions, the Prime Minister said. This will give us an opportunity of making more effective use of our resources and perhaps of introducing a new discipline into our industrial life. Co-operation and partnership should take the place of the old harsh discipline of unemployment. Speaking of the Common Market discussions, he said the electrical industry was buoyant and progressive, so it had little to fear from the broader overseas markets out of which prosperity could be won and by which we could play an even greater role in our assistance to under-developed countries.

Industry Soaks up Capital

The position of the electrical industry was put by Lord Chandos in replying to the toast. The industry's output of machinery and apparatus was worth about £1,500 million a year, with exports around £300 million. These were the reasons why the Association had been bold enough to ask the Prime Minister to the dinner. The electrical industry, he continued, was one of the greatest sponges of capital. Electrical engineers had an uncomfortable way of making new discoveries which might require millions of pounds to develop. The truth was that man's ingenuity had outrun his ability to finance his inventions. Vast sums were spent on research development, plant and equipment at the same time profit margins were under severe pressure; the return on risk capital had been steadily falling. We were all trying to increase our efficiency, Lord Chandos continued, in order to sustain the large bill for research and development, essential if we were to remain a dynamic industry.

In both Government and public opinion the point of view of the producer was being pushed further into the background, he complained, while that of the so-called consumer was getting more into the foreground. Lord Chandos considered there was some danger of undermining the foundations of industry by disregarding the interests of the producers. Care was needed that the consumer was not protected to such an extent that the industry from which he derived his income was made bankrupt.

President Anthony M. Browne greets the Prime Minister

On broad principles, Lord Chandos said he was in favour of the Restrictive Practices Act. But its stringent application had been one of the causes of difficulties in running the electrical industry on sound lines. Also, its application coincided with intense new competition overseas. His plea, therefore, was that the producer should be regarded as the principal source of our wealth, someone to be wooed and not only exhorted and warned.

Stable Policy Wanted

The Prime Minister had made some reference to planning. We in the electrical industry had to plan carefully for many years ahead, he said, the minimum was about a four-year programme. Frequently we got our planning wrong, and Lord Chandos hoped the Prime Minister would not consider it indelicate if he mentioned that some of the mistakes were the fault of the Government. About 40% of plant made by the electrical industry went into Government use and was thus subject to fluctuation in the Government's policy towards capital investment. The remaining 60% had been subject to the wayward action of the Government, action which would defeat any computer to forecast and would need someone like Hitler's astrologer.

Clearly, the new planning body to which the Prime Minister had referred should direct its main efforts towards forming longer-term and more stable Government policy, since its action over its own investment, interest rates and taxation was the key to the steady growth of our economy. It was on this matter that BEAMA had directed its attention and had made representations. The Government will not find BEAMA narrow-minded or convinced that they could go on entirely on their own in the matter of prices and markets. But with export margins which were so vital to our country, becoming tight, if prices at home were subject to similar pressures, we shall be forced either unpatriotically to do less export business or, patriotically, and amidst the plaudits of consumers and economists, go bankrupt.

Wiring rules amended

EXTENDED USE OF ALUMINIUM CONDUCTORS RECOGNISED

ALUMINIUM as a cable conductor receives extended recognition in the IEE Wiring Rules as a result of a list of amendments to the thirteenth edition, issued last week. The changes are in the main connected with the availability of British Standard 3346:1961, for armoured p.v.c.-insulated cables. Extensive new current rating tables for cables to this specification make up the greater part of the amendment.

The amendments are published in the same week that the IEE announce preparations for a fourteenth edition of the Regulations.

Cable Identification

Although the cable change occasions publication of the amendments, the opportunity has been taken of making a number of other changes. The most important of these is recognition of green-and-yellow as an alternative to green alone in the identification of earth cores of flexibles (Reg. 206C). This change was made following international discussions on the danger caused by imported goods having earth cores identified by colours other than those common in the importing country. In any length of 0·6 in. of the core, each of the colours green and yellow must cover at least 30% of the surface of the core (Reg. 607 and Table 7).

There are changes in cable identification practice other than that. A specific numbering code for core identification is now written into the Rules. It is 1, 2 and 3 for live conductors, 0 for the neutral, and 4 for any special purpose fifth core (Reg. 206A), (i) and (ii)). Also, orange is recognised as the identifying colour for a fifth core (Reg. 206A, (i) and (ii)).

Strength and Corrosion

Mechanical and chemical characteristics of aluminium as distinct from copper are recognised in a number of changes from the 13th edition. For instance, a new note to Reg. 207A (cable terminals) calls for special precautions to avoid undue mechanical stress on an aluminium conductor, as might be caused by over-tightening a clamping screw at a terminal. The same note warns that special techniques will be necessary when aluminium conductors are terminated in soldering sockets.

Where an aluminium conductor is in contact with a terminal of brass or other metal having a high copper content, precautions are required to be taken to prevent corrosion, particularly in damp situations (Regs. 207, 215), and the same requirement applies, plus precautions against mechanical damage, when an aluminium conductor and a copper conductor are joined together (Reg. 208). There is a general ban on small aluminium conductors. Any conductors of cross-sectional area 0·0225 sq in. (7/·064 in.) or less have to be of copper (Reg. 606).

Corrosion and strength problems beyond those connected with aluminium are the subject of several amendments. A change to Regs. 207 and 208 removes the complete ban on soldering fluxes containing acid or other corrosive substances. In future, it is only soldering fluxes which remain acid or corrosive at the completion of the soldering operations which may not be used.

Armoured p.v.c.-insulated cables installed in damp situations or in places where they are exposed to the weather or risk of corrosion, are required to have an overall extruded covering of p.v.c. The same applies when they are in a duct, and the duct becomes damp (Regs. 213B and 223F). A note to Reg. 606 draws attention to reliance on armouring for earth continuity in the case of armoured p.v.c.-insulated cables. This needs to be borne in mind when deciding on the precautions necessary against mechanical damage or corrosion.

Underground cables between buildings, Reg. 229B(i), may be of armoured p.v.c.-insulated design, with p.v.c. overall covering; and m.i.c.s. cable in this application may be p.v.c.-covered.

The permissible bending radius for armoured p.v.c.-insulated cables is put at eight times the radius of the cable (Table 8). A new table for spacing of supports (Table 9) is now given, relating the maximum spacing of clips to the overall diameter of the cable, instead of the cross-sectional area. The table now covers m.i.c.s. cables as well as other non-armoured and armoured types.

Current Ratings

Current rating tables provide for either copper or aluminium conductors for armoured p.v.c.-insulated cables to BS 3346. The aluminium conductor ratings are considerably lower for a given conductor size. The revised tables do not provide for non-armoured p.v.c.-insulated cables having aluminium cores, although cables to BS 2004 seem permitted in sizes above 7/·064 in.

There remain a few detailed changes to be noted. One of these concerns the definition of "extra-low" voltage. This is being changed to meet international practice, and will in future extend to supplies not normally exceeding 50 V r.m.s. a.c., with a maximum of 30 V r.m.s. to earth.

High Temperatures

Cables for high temperature working have made use of recently introduced materials in the past few years. This is recognised in the present amendments, through a change in Reg. 211A. Maximum temperatures are now given for the following types of cable—varnished cambric with heat-resisting fibre, silicone rubber, and butyl-rubber with heat-resisting fibre. Mineral-insulated cable is recognised, with no temperature limit set, and asbestos-roved rubber or cambric flexibles are removed from the table. A change in Reg. 211B also eliminates asbestos-roved flexible cord for bringing into high temperature lighting fittings and the like, and substitutes the three types of cable (other than m.i.c.s.) just mentioned.

Incidentally, mineral insulated cable is now referred to as "mineral-insulated copper-sheathed" instead of "mineral-insulated metal-sheathed."

Readers Views

Correspondents writing under pseudonyms are asked to submit their names and addresses in confidence to the Editor

Current-operated E.L.C.B's

I HAVE followed the correspondence in your columns relating to the above with a great deal of interest. It would appear from the various remarks in general, and Mr J. A. Robbin's comments in particular, that very little work has been done in the United Kingdom on very sensitive current-operated earth-leakage protection for domestic use.

It will, no doubt, be of some interest to your readers to learn that the company with which I am associated has specialised in the field of sensitive current-operated earth-leakage protection for some six years, and that several hundreds of current-operated earth-leakage units of 20 mA sensitivity have been in use in dwellings, laboratories, etc., in the Republic of South Africa for several years and are performing satisfactorily.

Based on our experience in the field we have established that a sensitivity of 20 mA may be tolerated when considering normal standing leakages in domestic installations due to stoveplates, electric water heaters, hot-plates, etc.

Earth-leakage equipment operating at a sensitivity of 20 mA will also ensure protection of persons against electrocution due to ventricular fibrillation (the level for this condition being generally accepted as an average value of 100 mA for 3 sec.).

The unit developed by my company, and with which we have been successful, operates on the magnetic-amplifier principle, has a sensitivity of 20 mA and is designed for a continuous full-load current at 60 A at 200 V to 250 V, 50 c/s single-phase. The overall response time of the earth-leakage unit and associated circuit-breaker with an earth fault of 25 mA applied and under full-load conditions at 250 V, is 0·018 sec.

The unit was tested for transient switching surges and did not trigger when three successive 6 kV 1/50 micro-sec impulses were applied.

The price of the magnetic-amplifier core-balance earth-leakage unit and associated circuit-breaker is competitive with that of well-known potential earth-leakage circuit-breakers on the market when one considers the additional expenditure involved in the case of the latter units for installing the special earthing spike and associated wiring.

H. P. Smith, B.SC.(ENG.), A.M.(S.A.), I.E.E.,
F. W. ELECTRICAL INDUSTRIES (PTY) LTD.,
ALBERTON, TRANSVAAL.

Heating Control

I HAVE read Mr I. G. Maclaren's letter in Readers' Views (5 October) and, through the courtesy of your columns, I should like to make the following remarks in reply:

Within the limits of an article of reasonable length, an attempt was made to outline controls actually in current use with electrical underfloor heating and thermal storage systems. The thermal acceleration of room thermostats was dealt with at some length because it is frequently improperly understood, but in specific reference to the title of the article, the limitation of control by room thermostats, accelerated or unaccelerated, was remarked upon. My article suggested that some increase in the setting temperature may have to be made if an accelerated type of room thermostat is used; this is, of course, to allow for the pulsing effect referred to by Mr Maclaren in his letter. It also made clear that excessive acceleration, as possessed in some designs, is highly undesirable.

The latter part of the article should make it quite clear that the writer does not feel that room thermostats alone are necessarily the best method of controlling electrical storage systems. However, they are very frequently used and, therefore, some appreciation of what they can do and what they cannot do would seem advisable.

With reference to the third paragraph of Mr Maclaren's letter, concerning the background heating of flats, there would seem to be no disagreement and it is not suggested that room thermostats alone are particularly suitable for this type of installation.

In the case of background heating in flats, the more recently developed inside/outside controller (Ratiomatic) described in the article has the virtue of proportioning the charge to the prevailing heat loss and tempering it by the internal heat loss and/or internal heat gain by means of a room thermostat. With this arrangement, the use of supplementary heaters in the shape of electric fires or convectors cannot diminish the basic charge determined by the outside element and, furthermore, the charge will commence as soon as energy is provided at 7 p.m.

With reference to Mr Maclaren's penultimate paragraph, the validity of this remark depends on the storage capacity and surface temperatures. This fact was given due acknowledgement in the author's remarks.

S. O. Grant,
RHEOSTATIC LTD.,
LONDON S.W.1.

Article

METEOR referred, in your issue of 19 October, to a recent hearing before the Lands Tribunal in which a television studio was seeking derating. I assume that he did not read the "Times Law Report" on the proceedings or he might also have been struck by the fact that the studio uses (if I remember the figure correctly) 500,000 kW/annum (*sic*)—but this is by the way.

I was more interested in two other aspects of the matter that did not appear to have been considered, namely:

(1) Is a generating station an industrial hereditament —whatever that may be?

If it is, I cannot see any difference in principle between turning out 19 megawatts and 19 milliwatts (plus, apparently, 1 milliwatt for the sound). Incidentally, I am not sure what these figures represent but assume it to be what is passed to the control room; i.e., not to the ultimate user.

(2) Surely, the television studio is not working to supply any milliwatts at all; the electricity in this case is purely a vehicle delivering, just as the baker's van may deliver my American Marvel Loaf, a representation of, may we say, "Autumn Crocus" to the people.

It seems to me, then, as if the argument should be about whether the latter is an article—a question that surely demands, by legal metonymy, the answer "Yes," if the whole contains as part of it the other article mentioned by *Meteor*.

F. W. Jordan,
TEDDINGTON, MIDDX.

Aluminium busbars

SOME DESIGNS AND RECENT INSTALLATIONS

by P. J. H. Rata, B.Sc.(Eng.), A.C.G.I., Grad.I.E.E.*

WHEN Electro-Chemical Engineering Company installed a new nickel and chromium plating plant for Jaguar Cars Ltd. at Coventry, their decision to use aluminium busbar reduced the cost of the installation by 20%. This installation involved some ten tons of busbar between the 62,500 A rectifier equipment and the process tanks.

Such substantial savings in capital expenditure are common where aluminium busbar installations are concerned, owing to the very large sizes that are often necessary. For this reason, the material is widely used in electrochemical plants and complete reliability has been proved—often under severely corrosive conditions. Similar economies can be obtained, however, in any application where power is distributed in large quantities.

The weight of an aluminium conductor is only half that of the equivalent copper conductor and so, not only will an aluminium bar cost less, it will be lighter and easier to install.

There are two aluminium busbar materials;[1] electrical purity aluminium (BS 2898 EIE), which has the higher conductivity but rather low tensile strength, and a heat-treated, magnesium-silicon alloy (BS 2898 E9IE), which has an ultimate tensile strength some three times that of electrical purity aluminium at the expense of only a slight decrease in conductivity (see Table I).

Table I. Properties of Electrical Grades of Aluminium (BS 2898 : 1957) and High Conductivity Copper

	Electrical Purity Aluminium (EIE)	Aluminium Alloy (E9IE)	High Conductivity Copper
Min. 0·1% proof stress, tons/sq in.	2	10·5	15
Min. ultimate tensile stress, tons/sq in.	4	13	20
Max. resistivity at 20°C, microhm cm....	2·873	3·133	1·7241
Min. conductivity, % IACS ...	60	55	100
Temperature coefficient of resistance/°C...	0·00403	0·00364	0·00393
Temperature coefficient of expansion	23×10^{-6}	23×10^{-6}	17×10^{-6}
Modulus of elasticity lb/sq in.	10×10^6	$9{\cdot}5 \times 10^6$	18×10^6

Comparison of Costs

In recent years the price of copper has been subject to wide fluctuations, but even at its lowest level—about £160/ton—aluminium busbar still offered a saving in cost. At the present time, this cost advantage can amount to 50% or, in exceptional circumstances, a little more.

This difference in cost can be illustrated by considering a typical small electro-plating plant for which, say, a 760 ft run of 3 in. by ¼ in. copper bar would be required; the equivalent electrical-purity aluminium bar of equal resistance would be 5 in. by ¼ in. If the ingot price of copper is taken as £240/ton and that of aluminium £186/ton, the estimated costs for the two materials based on recent quotations would be as follows:

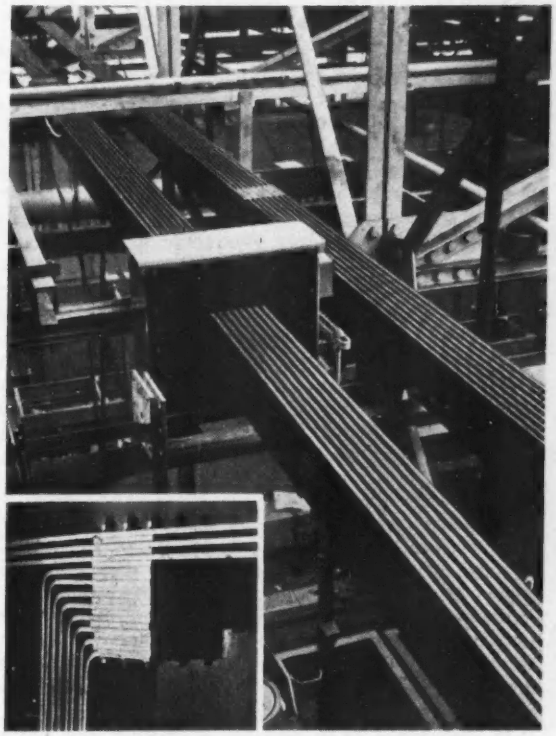


Fig. 1. A view of the aluminium busbars in the electro-plating shop at Jaguar Cars Ltd., Coventry, with, inset, a close-up of one of the joints

Material	Size	d.c. resistance at 20°C	d.c. rating for 50°C rise above ambient temperature of 30°C	Cost
	in.	Microhm/ft	Amp	£
High Conductivity Copper ...	3 × ¼	10·9	1220[a]	340
Electrical Purity Aluminium ...	5 × ¼	10·86	1545[a]	170

This shows a saving of 50% by using aluminium. The comparison, based on equal resistance, also illustrates the increase in current-carrying capacity for a given temperature rise that can be achieved with the larger aluminium bar, since it has a greater surface area for heat dissipation.

For general use, busbar sections are, in fact, based on current-carrying capacity in terms of temperature rise rather than on equal resistance as shown above. If this cost comparison is repeated for a 760 ft run, but substituting the stronger aluminium alloy (E9IE) for the electrical purity material and basing the rating upon temperature rise instead of equal resistance, estimated costs would be as follows:

Material	Size	d.c. resistance at 20°C	d.c. rating for 50°C rise above ambient temperature of 30°C	Cost
	in.	Microhm/ft	Amp	£
High Conductivity Copper ...	3 × ¼	10·9	1220[a]	340
Aluminium Alloy (E9IE) ...	4 × ¼	14·8	1260[a]	155

Again, the use of aluminium would result in a considerable saving and, in this instance, no less than 54%.

* Alcan Industries Ltd.

Jointing

A great deal has been written about joints in aluminium and fears have been expressed about the reliability of joints both between sections of aluminium and between aluminium and copper. Undoubtedly, some difficulties have been experienced in the past which have mainly been due to bad practice but, provided that joints are properly designed, completely trouble-free service can be expected. Experience in electro-plating plant and GPO telephone exchanges, where aluminium busbar is widely used, has proved its reliability. The low voltages involved in these applications render such systems very sensitive to poor jointing but both bolted and welded joints, which are simple to make, have given excellent service.

The simplest form of jointing is by bolting or clamping sections together. Areas of overlap should be generous. Pressure should be applied as uniformly as possible, using a large number of small bolts across the overlap rather than one or two large bolts at the centre of the joint. Contact surfaces must be cleaned, preferably by wire-brushing under grease, and it is good practice to smear the mating surfaces with a suitable grease before assembly. This will seal the joint against the ingress of moisture and prevent the reformation of the oxide skin. The grease should be of a high-melting-point type which will remain in the joint under all atmospheric conditions. Alternatively, Densal compound,[4] a high-melting point grease with corrosion-inhibiting additives, may be used. This compound is of particular value for busbars which are situated outdoors or in aggressive atmospheres.

In considering joints between aluminium and copper, it is important to remember that electrolytic corrosion will only occur in the presence of moisture. Where such conditions are likely to be met, particularly outdoors, the joint must be protected. This is readily achieved by taping or painting. In ordinary indoor atmospheres the use of Densal or a high-melting-point grease is sufficient.

Greater attention has recently been given to welding sections together, using either metal-inert-gas (MIG) or tungsten-inert-gas (TIG) processes. Such joints are efficient electrically, are permanent and have a good appearance. Furthermore, drilling and the use of bolts and accessories is eliminated. Some loss of strength occurs in the weld area when using aluminium-alloy bar though full annealing does not occur. Often this is of negligible importance but, where a design requires full mechanical properties as in some channel and tubular busbar applications, it is necessary to build up the joints with additional reinforcing material. Wherever possible, joints should be located at positions where stresses are low.

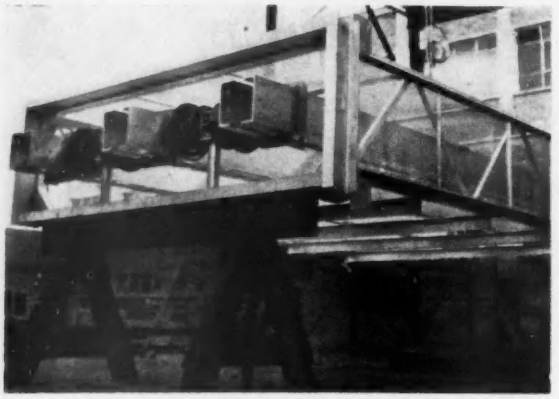


Fig. 2. Channel section aluminium e.h.t. busbars for Komati, South Africa, assembled for testing prior to dispatch

Choice of Section

Almost all busbar requirements can be met by either rectangular, channel, angle, tubular or solid round sections. These are produced in lengths up to 30 ft or more by extrusion. The versatility of this process enables more intricate shapes to be produced quite economically when required for special applications.

The selection of the most suitable section and material is usually a straightforward process dependent upon the requirements of the system. There are four main factors to consider, temperature rise, voltage drop, power loss and mechanical strength, and the relative importance of these varies with the application. The following outlines of a few typical systems illustrate the influence of these factors upon the design.

1. *Electro-plating and Electro-chemical Plant.* This application usually involves large direct currents at low voltages. Fig. 1, a section of busbar in the electro-plating shop of Jaguar Cars Ltd., is typical of this type of installation. Mechanical strength is required only to support the weight of the bars, and it is normal practice to use rectangular sections in electrical-purity aluminium. Multiple runs are generally used to achieve capacity, the bars being laid on edge in comb insulators. With a small temperature rise, to limit voltage drop and with the inherent flexibility in such systems, expansion joints are generally unnecessary.

2. *Factory Busbar.* These are generally medium-voltage, air-insulated, a.c. applications for which aluminium alloy bars, with their greater mechanical strength, are usually preferred. Rectangular and solid round sections are most commonly used but, occasionally, small channel sections can be utilised to obtain more compact arrangements. Designs are based on temperature rise and weight saving is of importance for ease of handling during erection.

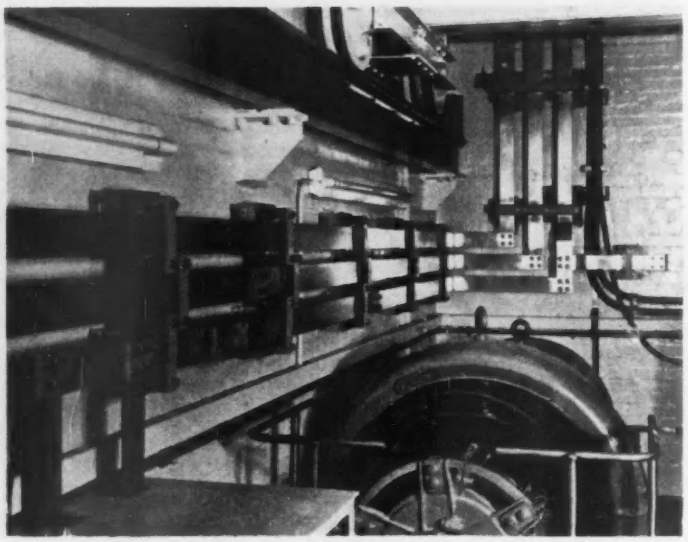


Fig. 3. Part of the aluminium busbar distribution system at the UKAEA establishment, Harwell

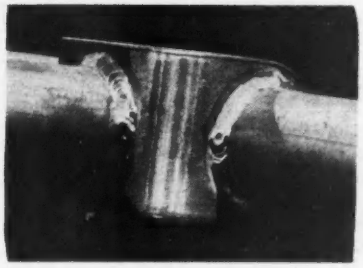


Fig. 4. The method of producing a right-angle bend in tubular aluminium busbars by welding

since the installations are often 8 ft to 10 ft, or even higher, above floor level. A section of an extensive busbar system at the UKAEA establishment at Harwell is shown in Fig. 3. There is a growing trend towards bus-duct systems which provide efficient distribution with great flexibility, a vital feature where extensions and modifications are likely. In one such system, for example, complete three-phase assemblies, with rectangular aluminium alloy bars rated at 200 A, are produced in 8 ft long sections that weigh only 66 lb complete and ready for erection.

3. *Heavy Current Busbar.* For air-insulated e.h.v., a.c. busbar where short-circuit forces are likely to be very great, double channel or angle sections provide the strongest and most economical systems. Since, as with electro-plating installations, the sections are often very large, the saving in capital expenditure offered by aluminium is considerable. These sections are usually rated on a temperature-rise basis and full allowance must be made for both skin- and proximity-effects.

Komati Bus-system

A number of such installations using aluminium-alloy channels have recently been completed. A particularly interesting example is that carried out by Hubert Davies Ltd., of Johannesburg, for the Electricity Supply Commission of South Africa (Fig. 2) at Komati Generating Station.† This was for two sets of generator busbar rated at 6,600 A, 11 kV, and illustrates several features in the construction of such a busbar. The busbar was submitted to full fault rating which proved its mechanical reliability and the results of these tests should dispel any doubts about the strength of aluminium-alloy busbar or its ability to withstand high short-circuit stresses. Two 10 in. by 3 in. channels form the main bar and, in selecting this size, allowance had to be made for high altitude and high ambient temperature. Where the busbar passes through the station wall, tubes 10¾ in. o.d. have been used to simplify bushings. The busbar was arranged in four sections connected by flexible expansion joints. All the supporting clamps were designed to permit sliding of the busbar sections, but one set of clamps on each length adjacent to an expansion joint was fixed to the busbar. Bolted joints with splice-plates have been used throughout. The contact surfaces were coated with Densal compound and scratch-brushed under the compound before assembly. The flexible connectors were built up from stranded conductor welded into plates bolted to the bars.

4. *Tubular Busbar.* Whilst in the past little use has been made of tubular aluminium busbar in this country, it is widely used abroad in countries as far apart as USA, India and Africa. There is now, however, increasing interest in the uses of tubular aluminium-alloy busbar for super-tension substations, where long spans are often involved and current ratings are high. The large-diameter sections necessary to carry large currents over these spans offer the additional advantage of restricting corona losses. Welding is ideal for jointing tubular busbars (Fig. 4). Clamps are sometimes used but these become disproportionately expensive with increasing tube diameter.

† See also ELECTRICAL TIMES, 27 April, 1961, page 665.

Bus-bars at Lydd

An unusual installation, using aluminium-alloy tubes, is at the CEGB Converter Station at Lydd (Fig. 5). These bars, which are 70 mm o.d., connect the British end of the cross-Channel power cable to the rectifier/converter installation, and operate at 100 kV d.c. to earth. All connections and joints are made by welding. Terminal connections and "T" joints were specially designed by ASEA to enable control cables to run through the inside of the tubes.

Experience has shown that aluminium busbar gives excellent service under a wide variety of conditions and it can be particularly useful where they are aggressive. Added to this are the advantages of the savings on capital expenditure—which may be considerable in large installations—and ease of erection. There can be little doubt that engineers will more fully realise the potentialities of aluminium busbar as a labour- and money-saving material as it is put to increasingly wide use.

REFERENCES

1. BS 2898:1957: "Wrought Aluminium and Aluminium Alloys for Electrical Purposes—Bars and Sections."
2. "Copper for Busbars," published by the Copper Development Association.
3. "Aluminium Busbar," published by Hutchinson Scientific and Technical for Alcan Industries Ltd.
4. "Densal" Compound. Manufactured by Messrs Winn and Coales Ltd., Denso House, Chapel Road, London S.E.27.

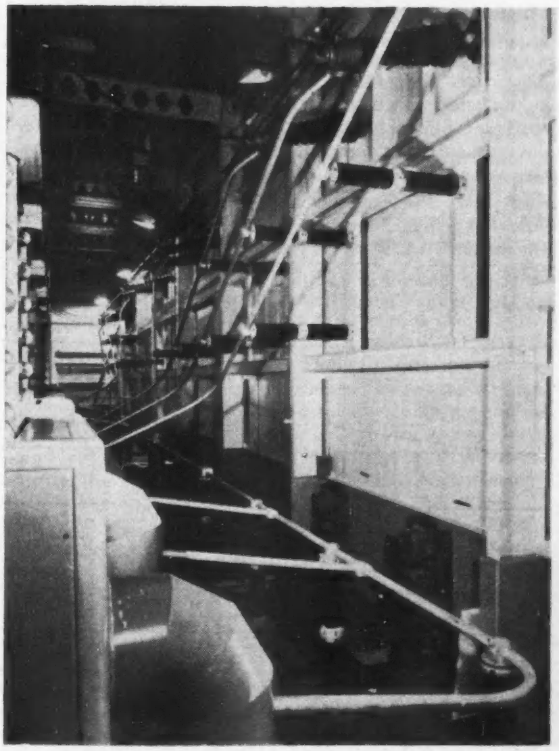


Fig. 5. Tubular aluminium busbar system on the 100 kV, d.c. side of the cross-Channel rectifier substation of the CEGB at Lydd

Nigerian Supply Progress

A 25·5% increase in sales of electricity for the year ended 31 March, 1961, is recorded in the annual report of the Electricity Corporation of Nigeria. The 25·5% rise in sales brought the total number of units sold during the year to 360·3 million, while the number of units generated rose to 448·3 million. The Corporation has increased sales by six times in the ten years since vesting day and has also doubled its sales in the past three years.

Trading results were also good. The surplus rose to a net value of £874,334, compared with £442,095 last year. Revenue rose considerably, by 22·5% to £5,739,166, but the average price of units sold fell slightly from 3·85d to 3·77d. The average expenditure/unit also fell during the year from 3·29d to 2·94d.

During the year under review, 49,210 kW of new plant was added and a further 28,056 kW was under construction at the end of the year. The total plant in commission was 184·48 MW. Maximum demand also rose sharply by 27·3% to 95·1 MW, compared with 14·9% in the previous year. Practically all the maximum demands recorded occurred apparently during the Independence celebrations held in October.

As part of the new plant programme, a 30 MW steam turbo-alternator extension was completed to the Ijora "B" station, but it was not in commission at the end of the year. The "A" station was temporarily taken out of service for overhaul and standby.

Of the 184·5 MW of plant in commission at the end of the year under review, 132 MW was steam turbine plant and 48 MW diesel plant. Good progress is reported with extensions to the Kano "A" station, which is to have a 6 MW free-piston engine, and work also began on the 20 MW gas-turbine station at Afam, which will use natural gas. To meet peak loads, consideration is being given to the use of alternators driven by aircraft gas-turbines at Ijora in the interim period before the Niger Dams project is completed.

A new power station is planned for Sapele with a capacity of 10 MW, generated by gas-turbines, and the Kaduna station is to be extended by 6 MW of diesel plant.

In accordance with the needs of the Niger Dams project, the Corporation is interconnecting their larger stations by transmission lines. Two of these proposed lines will operate at 132 kV and link Kano to Kaduna and Aba to Oji. Delays on the 132 kV line from Lagos to Ibadan show, says the report, the undesirability of attempting this type of work with the prevailing acute shortage of engineering staff. Lines subsequently erected by overseas firms with experience are said to have been completed at far lower cost. Steps were taken to overcome the inadequacy of the feeder cable system in Lagos caused by the rapid expansion in demand, and 34 new transformer substations, totalling 10 MVA, were commissioned with associated h.v. and l.v. circuits.

Europe's Rising Electricity Needs

THE major power-producing countries of Europe again increased their production for 1960 over that for 1959 by amounts ranging from 5% to 14%, as shown in the table below. The table is derived from a recently published UN bulletin* which, in addition to tabulating the power generation for each country for the years 1956-60, contains particulars of fuel consumption and detailed breakdowns of consumption by each section of the communities.

The table below includes comparative figures for the USA. The figures for 1960 are provisional, but they show that, compared with 1959, the greatest increase in production (14%) occurred in Italy, although the consumption/inhabitant is the lowest of the eight countries with the highest electrical production. Norway managed to increase consumption by 9%, even though she surpasses the USA in consumption/head of population. In Great Britain, consumption rose by 13%, placing us for yearly consumption/inhabitant between Western Germany's 1,954 kWh and, surprisingly, Iceland's 2,568 kWh.

The tabulated figures for total electricity production exclude consumption by auxiliaries and station transformers, except for Italy and the USSR. The net power to consumers includes any self-generation by consumers, but it excludes losses in transmission and distribution.

* Annual Bulletin of Electric Energy Statistics for Europe, published by the United Nations, Geneva. Price 7s.

Electrical Energy Production and Consumption for 1959-60

(1) Country	(2) Year	(3) Total production 10^6 kWh	(4) Balance of: Imports + Exports − 10^6 kWh	(5) Net power to consumers 10^6 kWh	(6) Max. net continuous generating capacity in operation			(7) Net consumption per inhabitant kWh	(8) Industrial consumption as % of (5)
					Thermal MW	Hydro MW	Nuclear MW		
France	1959	64,680	+ 38	58,318	9,780	9,142	26	1,293	70·6
	1960	72,350	−150	65,100	10,290	9,800	50	1,430	71·1
Italy	1959	49,350	+189	42,090	4,054	10,822	—	858	67·8
	1960	56,240	−128	47,700	4,556	11,468	—	966	62·0
Norway	1959	28,635	—	25,315	156	5,622	—	7,119	62·4
	1960	31,335	+130	27,815	152	6,080	—	7,754	40·6
Sweden	1959	31,972	−552	27,449	1,834	6,622	—	3,682	58·8
	1960	34,529	−766	29,330	2,048	7,076	—	3,921	61·3
USSR	1959	265,112	—	231,740	46,452	12,710	105	1,100	78·5
	1960	292,421	—	255,595	51,816	14,779	105	1,192	78·4
UK	1959	114,539	−1	104,198	31,284	1,157	259	2,005	52·8
	1960	129,546	−1	117,192	33,088	1,166	296	2,237	52·1
USA	1959	795,251	+3,607	730,685	142,453	31,794	105	4,128	54·1
	1960	840,457	+4,548	772,620	151,872	33,089	297	4,290	53·5
W. Germany	1959	96,790	+2,870	91,387	20,130	3,185	—	1,767	71·5
	1960	108,926	+4,165	104,313	22,450	3,300	—	1,954	71·7

AROUND THE TRADE

BY PEREGRIN

THE chilly nights have given a gentle fillip to the heating sales—unfortunately, a little too gentle, for sales of the larger appliances are still in the doldrums; and for those brave enough to tackle the world of radio, portables have dropped off again with the end of the holiday season and rental seems the only outlet for television—a paying game if one can muster enough capital. Contracting is still booming and the only fly in the ointment is delivery. Consider just one instance, one of the suppliers who raise the contractors' blood-pressure over this problem. Their new set-up has, apparently, no cognisance of the word "Urgent" and customers cannot understand why an item quoted "ex manufacturer's stock" should take more than a week to arrive. Take fans: at one time the local branches stocked up to 24 in. and one could either pick one up as required or be sure of delivery within 48 hours. Now all stocks are held at one place and, by the time all the paper work has gone through the red tape machine, delivery may be anything from seven days to 14 days—and neither phone calls, telegrams or heartfelt pleas can alter the situation. Helping a customer out of a spot with super-swift delivery can often mean a long and, for the contractor, lucrative relationship; delay makes the client look for what he can pick up himself with someone else to install it.

I see that "Electricity for Safety" is the theme of the new EAW Campaign. I cannot, in my ignorance, see how one can develop such a theme other than with odious comparisons with other methods of heating—some of the cheaper electric blankets, perhaps, against the hot-water bottle? Or even some of the cheap fires on the market against the set-in gas fire? I would be grateful to know more. And what of last year's campaign? I do not remember seeing any report on "Electrical Viewpoint" but perhaps that is exclusive to the area boards. Contractors, either singly or through the ECA, give little enough support to the EAW; afraid, perhaps, to poke their noses in where they are not wanted, and I suppose to the tune of some £40,000 a year one can recognise that the EAW is now the Electricity Council's happy hunting ground. Or should we consider that £40,000 public money? Ah, well, we still survive in spite of, or maybe because of, the competition from the boards, the multiples, postal trading and the oil-fired heating campaign. Though, I repeat, it is high time that the heating manufacturers, BEAMA, ECA and EDA put their heads and their pockets together to devise some sound and effective publicity as a counterblast to that last item. There are many houses in the course of erection but the proportion of electrically heated to oil heated becomes increasingly smaller.

Keeping Food

I have just been given a booklet issued by the National Hygiene Council which, I understand, is Government-sponsored. Quite an interesting publication, distributed free as a sort of town guide in various larger towns—the cost, no doubt, being borne by the advertisements of the local tradespeople. One page is entitled "Living With a Fridge" and contains quite useful information for the housewife; but I am amazed to read that butter and fat should be kept close to the cooling coils and will keep for five days, milk for three days to four days, and that frozen foods and ice-cream are best eaten soon after purchase. If any publicity is likely to dampen the housewife's desire for a "fridge," or the salesmen's enthusiasm to sell her one, this is it. One of the benefits of a refrigerator is that shopping expeditions can be cut to a minimum, as food can be stored under safe conditions, and larger freezing chambers are now available to store the frozen food which has become part of our daily life. Butter, in my "fridge," is kept in the door panel for considerably longer than five days without any deterioration, and frozen foods and ice-cream will keep a week without difficulty. I am all for truth in advertising and safety in food storage, but this advice is not strictly correct or even reasonable, and could be depressing, if not actually damaging, to the sale of refrigerators. I hope the manufacturers will do something to combat this feeble publicity before the booklet ever comes to my town. "Fridge" sales are already sufficiently low without damning them with this faint praise.

Training for Sales

I see that Mr Dennis Jones, the Sales Training Officer of the NECTA, is going about his business with much enthusiasm and more than a modicum of success. At first, his activities were confined to a tour of the branches with talks to groups of sales assistants and discussions with their bosses; now, I hear, he has started a series of courses which should prove of great value to retailers, in so much as assistants will gain a deeper knowledge and a greater interest in the goods they sell. It takes a clever man to be both a retailer and a teacher of staff, and this course will fill the gap, besides bringing a different viewpoint to the subject. It may even teach the retailers themselves points in selling technique. One thing does puzzle me: most manufacturers of electrical appliances have given Mr Jones all possible assistance in this work by loan of apparatus, supplies of literature, etc., yet some—even of the leading manufacturers—have not troubled to keep Mr Jones supplied with details of their new productions, current literature and so on. Could it be that they fail to realise the value of these lectures and courses? Do they not recognise the fact that appliances explained and handled under expert guidance are the ones salesmen are happy and confident to sell? Or is it that they have grown so big that the directors have long lost sight of their publicity departments and such matters are delegated to the office boy? Perish the thought.

Incidentally, Mr Jones has published, through the ECA, a booklet entitled "Meeting the Customer's Electrical Needs." A sound common-sense, easily read and understood production which is bound to benefit the sales staff—if one can persuade them to read it!—so that I do not see the need for his apology that it may seem elementary to some. It is just what is needed.

We have just finished fire-prevention week and, as usual, electric wiring and electric blankets are pinpointed as black spots . . . or should it be red spots? . . . It is always a source of amazement to me that there are not more fires when I see the state of some of the wiring. I await the full report with interest.

Personalities *in the industry*

Mr G. T. King

Mr L. C. Penwill

Mr B. E. Gray

Brig J. Clemow

Mr E. K. Cole

The new secretary of the Electrical Contractors' Association (Incorp.) and allied associations is to be **Mr G. T. King,** A.M.I.C.E., A.M.I.MUN.E., M.I.P.H.E., barrister-at-law. He succeeds **Mr L. C. Penwill,** C.B.E., COMP.I.E.E., the present director and secretary, who retires on 2 Feb. next as we reported on 9 Feb. last. Mr King, who will join the Association's staff on 1 Jan., has been technical executive officer with the Association of British Chemical Manufacturers since 1955, and has previously held appointments with the municipalities of Chichester, Torquay, Eastbourne and Poole, and the East Suffolk and Norfolk River Board, after serving articles with the surveyor to the Barnstaple RDC and the city engineer of Exeter. Mr King is a former member of the Council, prizeman and twice medallist of the Institution of Municipal Engineers. It is also announced that **Mr B. E. Gray,** who has been in the service of the associations for nearly 21 years, has been appointed assistant secretary of the allied associations. He has had wide experience of the work of the Association and for the past 11 years has served as editor and publicity manager and also secretary of the Technical and Publicity Committees. Mr Penwill, whose valuable work on behalf of the associations is to end next February, started as their assistant secretary back in 1920, and when the then chief, Mr L. G. Tate, died suddenly in January, 1926, he took over as secretary and was subsequently appointed director in 1930.

At present city electrical engineer of Salisbury, Southern Rhodesia, **Mr J. E. Mitchell,** B.SC.(TECH.), M.I.E.E., M.I.MECH.E., is retiring in January next to become the general manager of the Rhodesia Congo Border Power Corporation Ltd. Mr Mitchell has been associated with the Salisbury undertaking for many years and, under his charge, it has grown 32 times in size to one with an output now of over 500 million units per annum. The Rhodesia Congo Border Power Corporation Ltd., which Mr Mitchell is joining, supplies electricity to large copper mines and towns on the Copperbelt of Northern Rhodesia, taking a large bulk supply from Kariba, and had an output last year of nearly 2,000 million units.

President of Ferranti-Packard Electric Ltd., **Mr T. Edmondson** has been elected president of the Canadian Electrical Manufacturers' Association.

Formerly chief engineer, Weapons, and a special director of Vickers Armstrongs (Aircraft) Ltd., **Brig J. Clemow** has been appointed engineering director of GEC (Electronics) Ltd.

Chairman and managing director of W. C. Holmes and Co. Ltd., **Mr F. Brian Holmes,** has retired from the position of managing director, but continues as chairman of the company and of the holding company, BHD Engineers Ltd. He is succeeded as managing director by **Mr A. J. M. Henshaw,** M.A., who has been assistant managing director since last year, and **Dr W. T. Cosby,** B.SC., PH.D., M.INST.F., M.INST.GAS.E., is appointed to the board of directors.

Some surprise was caused by the news last week-end that **Mr E. K. Cole,** C.B.E., has resigned from the boards of British Electronic Industries Ltd. and its subsidiary, E. K. Cole Ltd. Mr Cole was chairman and managing director of the latter concern at the time of the formation, along with Pye Ltd. of British Electronic Industries last year. Mr C. O. Stanley, chairman of BEI has stated that "Mr Cole has had differences of opinion with his colleagues on the board over two or three matters and has decided to resign." Mr Cole founded the Ekco radio business back in 1922 and was among the earliest to evolve a "battery eliminator" which enabled the many battery sets to be operated from the mains. The E. K. Cole Ltd. concern was formed in 1926. He is also a director of Ekco Plastics Ltd., Ekco-Ensign Electric Ltd. and many other associated companies.

Dr D. E. N. Davies, B.SC., M.SC., PH.D., has been appointed lecturer in the Department of Electrical Engineering at Birmingham University. **Mr E. D. R. Shearman,** B.SC.(ENG.), A.M.I.E.E., is to be senior lecturer in electromagnetism in that department from 1 Jan. next.

Mr R. E. Ansell has become sales director of Henry Wiggin and Co. Ltd., and **Mr C. Bowles** is appointed sales manager, responsible to Mr Ansell.

At present district administrative officer of the West End district of the London Electricity Board, **Mr E. W. Herring,** A.C.I.S., has been appointed to succeed **Mr T. Porter** in a similar capacity on the latter's retirement from the Board. Mr Herring will assume his new post on 1 Jan. next (*ESH, pages 80/82).

Sales director of the new Shipton group amalgamation, Shipton Automation (Sales) Ltd. is **Mr F. Jasper,** who has previously been general sales manager of Modern Telephones Ltd. and marketing manager of Telephone Rentals Ltd.

Mr A. B. Brown has been appointed a director of James Scott and Co. (Electrical Engineers) Ltd.

Mr N. V. Chapman, B.ARCH., DES.R.C.A., has joined the Council of Industrial Design as industrial liaison officer for engineering consumer goods. Mr Chapman, who succeeds Mr H. Upjohn, will be responsible for contacts with electric heaters, cookers, refrigerators, powered kitchen and laundry equipment, vacuum cleaners, lighting fittings, razors, hair-

**Denotes revision to the "Electricity Supply Handbook, 1961."*

dryers, switches and plugs, in addition to certain non-electrical items. He was with AEI Lamp and Lighting Co. from 1955 to 1957, and designed their Satina range of pendant lighting fittings which gained a Design Centre award in 1958. More recently he has been connected with Revo Electric Co. and other concerns.

Newly elected chairman of the Institution of Works Managers is **Mr J. Ayres,** M.I.E.E., M.I.P.E., F.I.W.M., who has been managing director of Simms Motor Units Ltd. since 1958.

Four more appointments in their Major Domestic Appliances group are announced by Philips Electrical Ltd. **Mr T. Karen** becomes product design manager. He was previously senior designer with the Appearance Design Unit of AEI-Hotpoint Ltd. **Mr B. Dunne,** also from AEI-Hotpoint, becomes senior product designer, and the other two newcomers to the Group are **Mr T. A. Coombs** (again from AEI Hotpoint) and **Mr M. Bliss** (previously head of personnel administration and travel with Taylor Woodrow).

Assistant chief engineer, Transformer Engineering Department, Rugby, since December, 1959, **Mr G. N. Leech,** B.SC., A.M.I.E.E., has been promoted to chief engineer, Power Transformers (Rugby), in the AEI Transformer Division. Educated at the Methodist College, Belfast, and Queen's University, Belfast, Mr Leech served a graduate apprenticeship at the BTH Rugby Works, and in 1937 became an engineer in the Transformer Engineering Department.

Managing director of Glenfield and Kennedy Ltd., **Mr A. Robertson** has been elected chairman of the British Valve Manufacturers' Association.

Following the acquisition of a 40% holding in International Power and Engineering Consultants Ltd. by the British Columbia Government (ELECTRICAL TIMES, last week's issue), **Dr Thomas Ingledow,** B.SC., M.A., D.SC., F.AM.I.E.E., M.E.I.C., P.ENG., has resigned as president of that concern, and is expected to enter private practice. Recognised as one of Canada's leading engineers, he has had executive responsibility over the past 20 years for the engineering design, construction and operation of the British Columbia Power Corporation group of companies.

Chief draughtsman at the Yorkshire Electricity Board's head office, **Mr H. Sykes** retired recently after 50 years' service in the industry. He was with the Yorkshire Electric Power Co. from 1911, holding successive appointments, ultimately as senior draughtsman and from April, 1948, became chief draughtsman in the chief engineer's department of the YEB. In recognition of his long service, the Board presented him with a bureau, and his office colleagues presented him with a gold wrist-watch, together with a pipe and pouch.

Formerly technical director, **Mr R. W. Carr-Hill** has been appointed managing director of Liptak Ltd.

Mr A. J. Bass, Mr J. G. E. Davies, Mr S. L. Ward and **Mr A. W. Wylde,** D.F.C., A.F.M., of the Transmission and Radio Towers Division of Blaw Knox Ltd. have been appointed divisional directors of the company.

Mr R. J. Piercy has been elected president of the Radio and Television Retailers' Association.

Mr J. B. H. Jackson has been appointed an additional director of Ada (Halifax) Ltd.

Previously works director of Prior Stokers Ltd. and its associate company, Zephair Ltd., **Mr A. E. A. Wright,** T.D., A.M.I.E.E., A.M.B.I.M., has joined the British Central Electrical Co. Ltd. as agent for the sale of their speciality products in East Anglia.

The new London office of the Ruston and Hornsby group will be controlled by **Mr T. L. Kendall** who has been appointed executive director, resident in London. Mr Kendall has been a member of the Ruston board since 1949. **Mr J. G. Barber,** who has been the firm's Ruston London office manager for the past 12 years, has now been appointed export area manager, Eastern bloc countries, and is succeeded by **Mr L. J. Lawrence** as office manager.

Formerly with Crompton Parkinson Ltd. as comptroller, **Mr P. B. Wood** has joined Associated Electrical Industries Ltd. as chief accountant in the Treasurers' Department. Earlier he had been chief accountant and company secretary of Rotax Ltd.

Mr F. P. S. Stammers, chairman and managing director of Radiation Ltd., who is at present in Australia, has had to go into hospital in Melbourne for an eye operation. It is likely to be about eight weeks before he returns to this country.

After 48 years' service **Mr L. H. Aspinall** has retired from the Transformer Engineering Department of the AEI (Rugby) Ltd., Transformer Division. Since 1929, when BTH received the first CEB order for 132 kV transformers, he has designed all sizes of transformers up to 150 kV.

At present sales manager of the Furnace Department of the General Electric Co. Ltd., **Mr C. J. Evans,** A.M.I.E.E., is joining Efco Furnaces Ltd. as southern area sales manager as from 1 Dec.

Two new directors have been appointed to the board of Stanley Works (GB) Ltd. **Mr A. G. Jones,** general works manager, becomes works director, and **Mr W. R. Mills,** general sales manager, is now sales director. **Mr W. M. Dingley** has relinquished his seat on the board in view of his increasing other commitments.

Mr H. O. McGough has resigned from the board of the General Electric Co. of Ireland Ltd. He joined the GEC in London in 1915 and was area manager in the Republic of Ireland until the formation of the Irish company, when he joined the board. He also established the branch of the EIBA in that country.

Brush Electrical Engineering Co. Ltd. announce the appointment to the board of **Mr F. H. Wood,** M.I.MECH.E., M.I.LOCO.E., **Dr L. R. Blake,** PH.D., B.SC.(HONS.)ENG., A.M.I.E.E., and **Mr R. A. Grierson,** M.I.E.E., M.I.PROD.E., ASSOC.MEM.A.M.E.M.E. Both Mr Wood and Dr Blake were previously executive directors and Mr Grierson a divisional manager. Mr Wood joined Brush-Bagnall Traction at Loughborough as chief mechanical designer, and in 1955 he undertook the additional duties of chief contracts engineer. In 1957 he became manager of the Traction Division, with responsibility for design, manufacture and sales of traction products and was appointed executive director in May, 1960. As a full director of the company he will be responsible for the

Mr G. N. Leech

Dr T. Ingledow

Mr A. E. A. Wright

Electrical Rotating Machines and Traction Divisions. Dr Blake was head of the Electrical Section Research Laboratory of B.T.H. Rugby from 1949 to 1956 when he joined the UK Atomic Energy Authority. Latterly he had been fast reactor technology manager at Dounreay, and joined Brush as an executive director in April last. In addition to his post as a full director, Dr Blake is director of engineering. Mr Grierson served his apprenticeship with the Electric Construction Co. and remained with that company until 1939. He was with the British Electric Resistance Co. from 1939 to 1943, and with Partridge Wilson and Co. from 1943 to 1947. After joining Brush in 1948, he served in various capacities, and immediately prior to his appointment as director was manager of the Transformer and Switchgear Divisions. He will continue to be in charge of these Divisions.

Mr W. A. E. Brown, A.M.I.E.E., has been appointed sub-area engineer of the Kent sub-area of the South Eastern Electricity Board in succession to the late Mr J. H. Blackmore (*ESH, page 88). Mr Brown is at present senior assistant engineer (development and planning) in the Board's Surrey sub-area. He received technical education at Kingston and Twickenham Technical Colleges and began his career in the electricity supply industry in 1934 as a mains assistant in the Twickenham district of the London and Home Counties JEA. After war service—in which he rose to the rank of major in the Royal Corps of Signals—he became assistant mains engineer at Twickenham and three years later was appointed technical assistant in the Kent sub-area. From 1951 to 1956 he was first assistant engineer in Seeboard's Kingston district and subsequently became second assistant engineer (development and planning) in the Surrey sub-area, being promoted to his present post in 1959.

Mr Norman Care, M.I.E.E., M.B.I.M., general sales manager of Aberdare Holdings Ltd., and general manager of South Wales Switchgear Ltd. has been appointed a director of Neckar Water Softener Co. Ltd., a member company of the Aberdare group.

Mr G. H. Doust has been appointed a director of Plessey International Ltd. He formerly controlled the commercial and sales departments of the Plessey Chemical and Metallurgical Division at Towcester.

As a result of reorganisation of British Standards Institution technical activities, several of the staff associated with electrical work receive promotion. **Mr J. F. Stanley,** B.SC.(ENG.), A.C.G.I., M.I.E.E., F.I.E.S., becomes deputy technical director (electrical). Mr Stanley joined the then British Engineering Standards Association in 1922, and from the beginning was closely associated with the work of the IEC as well as BSI. He has directed BSI work on electrical standards for 15 years, and for the last seven has been chief technical officer of the electrical section. Since 1947, he has been secretary of the British National Committee of IEC, and one of the delegates to CEE. He represents BSI on many other outside organisations, including the Wiring Regulations Committee of the IEE. Two other electrical division promotions involve **Mr P. Bingley,** A.M.I.E.E., and **Mr R. H. Wickenden,** B.SC.(ENG.), A.C.G.I., A.M.I.E.E. Mr Bingley has been with BSI since 1953, as a senior technical officer. He now becomes divisional chief technical officer. After training in the electrical contracting industry and wartime service with the Royal Corps of Signals, he returned to industry, specialising in the design of static converters. His BSI interests have been in the fields of switchgear, transformers, rotating machines and flameproof enclosures. Mr Wickenden who is promoted from technical officer to senior technical officer, was educated at City and Guilds College and after apprenticeship with Harland Engineering, worked in the supply industry. He joined the BSI in 1954.

In other BSI changes **Mr G. Weston,** O.B.E., the technical director, becomes associate director of the Institution, and **Dr H. M. Glass,** deputy technical director, is appointed technical director.

OBITUARY

Mr J. P. Gregory, B.SC.(ENG.), A.M.I.E.E., assistant manager at Rugby of the Control Gear Engineering Department, AEI Motor and Control Gear Division since 1959, died on 31 Oct., aged 47. For a number of years he had been a BEAMA representative on several of the BSI Crane Committees. With AEI he had specialised in industrial contactor control.

Mr P. T. Davies, B.SC., A.M.I.E.E., manager of the Switchgear Department of Johnson and Phillips Ltd. since November, 1956, died on 6 Nov. He gained early training at the English Electric Co.'s Stafford Works and subsequently spent 23 years with their Switchgear Section. He became general manager of the Brush Electrical Engineering Cardiff factory in 1950, followed by two years with South Wales Switchgear Ltd.

Mr F. C. Hoyle, A.M.I.E.E., formerly London sales director to the Record Electrical Co. Ltd., died on 2 Nov., aged 72. He was a director of the company for about 30 years, retiring in April, 1960.

Mr J. Myers, senior representative for dielectric generators in the Electro Heating Group of Research and Control Instruments Ltd., has died.

Col Sir John G. Crabbe, O.B.E., M.C., T.D., formerly a part-time member of the South of Scotland Electricity Board, died on 1 Nov., aged 69.

NEW LITERATURE

The E.A.W. Electrical Handbook

THE seventh edition of this book, which first appeared in 1934 has been completely revised since the publication of the sixth edition in 1956. Eight authors have contributed to the book, which is intended primarily as a textbook for the Electrical Association for Women's Certificate in Electrical Housecraft. The three main sections deal with principles, tariffs and practical applications. A simple, if rather wordy treatment has been adopted throughout. Brief reference is made to such items as floor-warming, in the section on heating. Washing machines and cookers come in for considerable attention in the domestic appliance descriptive passages and the book concludes with a chapter on treatment of electrical shock; not, however, by the mouth-to-mouth method. Seventh edition published by The English Universities Press Ltd., 312 pages, 7¼ in. by 4¼ in. Price 15s.

The Directory of Opportunities for Graduates, 1962

THE increased size of this book, over twice the number of pages of the 1957 edition, testifies to the value placed on it by the employers who take space in it. The book gives the graduate an outline of the activities, opportunities and prospects offered by 415 employers and over 21,000 copies are distributed free of charge to final-year university graduates. Over one-third of the employers listed are concerned with electrical or electronic engineering, but the scope of the book ranges over the whole field of industry and commerce. In addition to notes on each company, there is a 40-page classified company index and a 36-page introductory section, which includes two articles on industrial growth and the opportunities likely to be offered in the Common Market, and four light, satirical essays. Published by Cornmarket Press Ltd., 368 pages, 8¼ in. by 5¼ in. Price 8s 6d.

BOOKS' RECEIVED

Photometric Standards and the Unit of Light, by J. S. Preston. Historical account of development of fundamental standards in illuminating engineering, including details of standards used at present. No. 24 in the NPL Notes on Applied Science. Published by DSIR, and obtainable from HMSO, 32 pages, 9½ in. by 6 in. Price 3s.

Lead Cable Sheathing—Alloy Characteristics and Applications. Brief notes on standard alloys, covering composition and characteristics. Published by Lead Development Association, 12 pages, 8¼ in. by 5¼ in. Gratis.

Development of low-wattage linear sodium lamp

by K. Scott and R. F. Weston*

THE first linear-type sodium lamp was introduced in this country in 1958. Rated at 200 W, it had a light output of 20,000 lumens and was the first commercial light source to be made available with an efficiency of 100 lm/W. This lamp satisfied a requirement for a street lighting unit combining high efficiency and high lumen output with dimensions eminently suited to efficient lantern design.

The need for higher levels of illumination on trunk roads and principal suburban traffic routes is becoming more clearly recognised as a major contribution towards the national economy and to road safety. More recently, the importance of extending this practice to Class "B" roads and subsidiary suburban traffic routes is gaining acceptance. Assessment of lighting requirements for this type of application has shown a light output of some 5,000 lumens to 6,000 lumens to be suitable. For economic considerations it is desirable that this feature should be combined with small dimensions and electrical characteristics which will permit the lamp to be operated on simple series reactance control gear from the mains supply.

To meet this need, development work has been undertaken to design a new lamp combining these features with the high efficiency and maintenance characteristics of the 200 W linear lamp.

Electrode Losses

Previous experimental work had established that a lamp of construction identical with the 200 W design but of half the length could produce an efficiency of approximately 80 lm/W at a loading of 100 W. For the requirement in mind, this efficiency level was considered to be too low. The principal reason for the reduced efficiency is the amount of energy which is lost in the region of the lamp electrodes, and which is expended mainly in heating the electrodes and enabling them to support the electrical discharge through the lamp. These so-called electrode losses, which contribute but little to the useful light output from the lamp, are approximately proportional to the lamp current and, at 1·6 A, constitute some 25 W. It therefore follows that when the total lamp watts, in a given design, is reduced from 200 to 100, at constant current, as suggested above, the electrode losses are significantly increased as a proportion of the total electrical energy in the lamp.

Under these conditions we have a lamp which, for a total output of some 5,500 lumens, will consume some 48 W in the discharge plasma (where the efficiency will be in the order of 115 lm/W) plus some 25 W which is absorbed in electrode losses. Such a lamp would then have a wattage of approximately 73 W, with an efficiency of approximately 75 lm/W. This level of performance is little better than that which has for some time been obtained from conventional low-wattage U-shaped arc tube designs of lamp. Furthermore, with the low voltage drop/high current characteristic of the design, the series control gear will become disproportionately large and uneconomic. To improve this position it is necessary that we alter the ratio of arc current to lamp volt drop. In most types of discharge lamp, anode and cathode voltage drop are in the order of 8 V and 7 V, respectively, giving a combined wattage loss of approximately 15 times the lamp-running current. Reduction of lamp current therefore gives rise to reduced electrode losses and hence helps improve efficiency. In a given design, such as the 200 W linear lamp, reduction of lamp current also reduces the current density in the arc tube, which, as seen from Fig. 1, gives rise to an increased efficiency in the positive column. Unfortunately, this is accompanied by a reduction in heat losses, which result from recombination of ions and electrons at the arc tube wall. To overcome this adverse feature, it is necessary to improve the heat-retention properties of the arc tube environment in order that the temperature of the arc tube wall shall be maintained at the rather critical value necessary for the maintenance of correct sodium vapour pressure within the lamp.

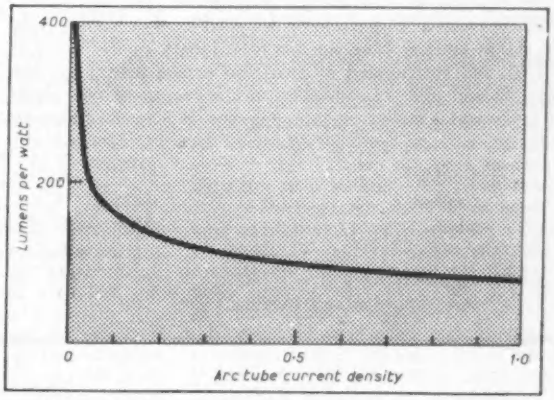


Fig. 1. Linear sodium lamp efficiency against current density

Heat Screening

In the 200 W lamp design, heat retention is achieved by the use of a high vacuum in the outer envelope, and a tubular glass heat screen disposed between the arc tube and the outer envelope. This heat screen tube reflects approximately 50% of the incident infra-red radiation back towards the arc tube, thereby helping to maintain its temperature. Additional screen tubes can be introduced to further reduce heat losses and increase arc tube efficiency, but each additional screen slightly reduces the amount of visible light transmitted from the lamp. It is found that in the case of a lower-wattage design lamp the adoption of two heat screens is advantageous in achieving the required combination of lumen output efficiency and electrical characteristics. The extent to which

* Mr Scott and Mr Weston are with the Lamp Engineering Department, AEI Lamp and Lighting Co. Ltd.

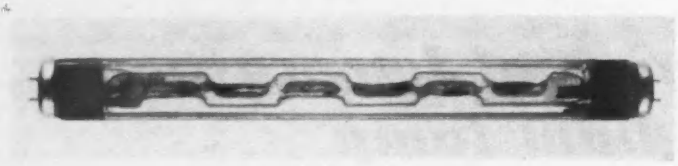


Fig. 2. This linear sodium lamp is 17 in. long over sockets, and has an efficiency of 100 lm/W after 100 hours burning

reduction of lamp current by reducing arc tube diameter can profitably be followed is limited by the decrease in total surface area of the lamp which is incurred, with consequent reduction in total light output.

Evaluation of the design parameters described above indicates that a lamp could be designed to give 5,000 lumens to 6,000 lumens from an arc tube length in the order of 12 in. and surrounded by two heat screen tubes, and that this should give an efficiency in the region of 100 lm/W. Experimental lamps made to this design give the following results:

Voltage	82 V
Current	0·825 A
Watts	60 W
Efficiency	100 lm/W
Apparent lamp power factor ...	0·9
Arc tube diameter (nominal) ...	¾ in.

Final Design

These lamps operate quite satisfactorily with series control gear on 200 V to 250 V supply, the volt-amps in the control gear being comparable with that established for 80 W tubular fluorescent lamps. Fig. 2 shows the finally developed design having an approximate overall length of 17 in. over standard bi-pin sockets, a wattage loading of 60 W with luminous efficiency after 100 hr burning of 100 lm/W and contained within an overall diameter of 1½ in.

With these dimensions, it is readily possible to design lighting fittings from which good distribution of illumination is obtained. This is combined with electrical characteristics which have been established as ensuring reliable operation under all street-lighting conditions with simple reactance control gear of well-proven design. It is believed that these properties offer a new light source which will prove to be a useful partner to the now established 200 W linear lamp. This should assist the secondary road-lighting schemes at an economic cost.

M.C.B's in Circuit Protection

ADVANTAGES of miniature circuit-breakers for circuit protection extend well beyond the obvious ability to reset after a trip with minimum trouble. Some of them were discussed before large invited audiences in a series of lectures given in London last week by Mr J. A. Robbins (J. A. Crabtree and Co.).

Time Delay Tripping

The ability to trip a circuit on a smaller sustained overload than a fuse will operate on is one advantage. It is affected by the sensitivity or otherwise of the tripping mechanism to ambient temperature. Suitable characteristics in this respect can be obtained from a bimetallic tripping device, but this does not give fast action on short-circuits. Addition of an instantaneous magnetic trip, operative at high currents only, cures this shortcoming, but is expensive.

A combined bimetal thermal trip and magnetically assisted, high-current instantaneous trip is a relatively inexpensive alternative to the combination. The bimetal trip on heavy current faults acts as a conductor and, through its associated magnetic field, is attracted to an adjacent ferromagnetic block. However, this arrangement may be sluggish at intermediate currents of a few hundred amp.

An improvement is given by a magnetic-hydraulic dashpot, in which tripping normally occurs when a ferrous plunger within a trip coil has moved sufficiently through a viscous fluid. This arrangement is unaffected by variations in ambient temperature. Above a preset current, the magnetic flux, associated with the tripping circuit, becomes sufficient to cause the tripping mechanism to operate without waiting for the plunger to move.

Dealing with the realities of short-circuit current magnitude in practical circuits, Mr Robbins suggested that for circuit power factors of 0·6 and above, current doubling effect could be neglected. As a rough guide, the maximum current that could flow at the l.v. terminals of a transformer was 20 times full load current. This value was rapidly reduced by any length of cable in circuit.

Although there was not yet a British Standard for m.c.b's (a draft was before industry for comment), there was now a test procedure agreed amongst manufacturers. This involved obtaining six clearances of faults from each of six breakers. After operation, the breakers had to be capable of carrying rated current safely. Tests were on a cycle, break fault current—make on fault and open—make on fault and open.

Discrimination

Discrimination between fuses and m.c.b's often gave rise to concern. M.C.B's had a minimum operating time of about 10 milliseconds although there was work in hand to reduce this. Over much of the current range the match between thermal capacity of protected equipment and protection operating-characteristic was better for m.c.b's than for fuses.

NON-DESTRUCTIVE TESTING

A CONFERENCE on non-destructive testing in electrical engineering opened at IEE headquarters yesterday, and is to continue until tomorrow. The conference, which will be reported in next week's ELECTRICAL TIMES, has been organised in seven sessions and, during it, 44 papers will be considered. Theme of the conference is "How best may the electrical engineer test the quality and endurance of his materials and structures." It is arranged in association with the British National Committee on Non-Destructive Testing.

The conference sessions are organised under subject headings as follows: properties of materials, components, cables, detection of concealed internal features, contacts and joints, and vibration.

STANDARDISATION PROGRESS

BRITISH STANDARDS . . . INTERNATIONAL RECOMMENDATIONS . . . INDUSTRY CODES

ONE of the two general specifications of the BS 3456 series, which are being prepared for use by the British Electrical Approvals Board for Domestic Appliances, has now been published. It is BS 3456: Part A—*Heating and Cooking Appliances, Section A.1. General Requirements.* It is expected that the sister specification, Part B—*Motor Operated Appliances, Section B.1. General Requirements,* will be published before the new year.

The idea of including all the requirements common to a large group of appliances into one general specification and then, where necessary, providing separate specifications to cover the unique characteristics of individual types of appliances has been borrowed from the CEE system of specification presentation. By grouping the common requirements in one specification, duplication of clauses in a large number of specifications is avoided. The system also mitigates against the introduction, however unintentional, of variations in standards and testing requirements for features common to a group of appliances. Furthermore, it eases the administrative burden of considering proposed amendments in that for the common items the minimum number of committees is involved. One important principle in the system is that the sections of BS 3456 dealing with particular types of appliances take precedence, where necessary, over the "General Requirement" section.

The BS 3456 sections dealing with particular appliances which have been published before Section A.1. will be suitably amended where necessary in order to erase any duplication of requirements contained in Section A.1. As a key specification, Section A.1. required special preparation. The CEE Publication No. 11 formed the basis, but naturally British practice had to be carefully considered in relation to each clause. It has meant, therefore, much discussion and negotiation by the committees involved, and a willingness often to see beyond British requirements, in an endeavour to approach nearer to international uniformity.

The system of preparation has been similar to that used for most BS specifications in the domestic electrical appliances field. A draft specification is first prepared by the Domestic Appliances Division of BEAMA and then submitted to the appropriate BSI Technical Committee (in this case ELE/82), the members of which represent a wide range of interested organisations. The final draft is then presented to the Electrical Industry Standards Committee, under whose supervision all electrical British Standards are prepared, for accepting the specification for publication.

Section A.1. is a comprehensive document including general conditions of testing as well as the detailed requirements to which appliances must comply, in order to bear the Approvals Mark. A point of interest is that the marking clause (repeated in all specifications of the BS 3456 series), calls for the use of the Approvals Mark, which can only be used under licence from BEAB. This means that a manufacturer can claim compliance with BS 3456 for his appliance only provided that it has obtained BEAB's approval.—*C. A. Zweigbergk.*

★ ★ ★

THREE classes of appliance are recognised in the Standard according to type of protection against electric shock: I, with exposed metalwork, etc.; IIA, all-insulated, IIB, double insulated; III, operated on extra-low voltage. The Standard gives tests for insulation effectiveness. Generally, a $\pm 7\frac{1}{2}\%$ (or 10 W if more) variation from nominal input power is permitted. Overload capacity is required to match practicable possibilities, and is checked at 20% overload input. Temperature rise limits are set for specified parts of appliances, with operation at 10% above nominal input.

Electrical tests for insulation are specified, and there is provision for checks that equipment as a whole is proof against humid conditions that may occur in normal use. Impact tests are specified to check mechanical strength, and stability must be sufficient to prevent overturning when an appliance is placed on a support at 10° to the horizontal. There is extensive provision for the checking of the general standard of construction, to ensure reasonable operation in service.

Thermal cut-outs, thermostats and the like have to undergo overload and a limited life test. The nature of flexible cords is covered, and so is the design of terminals. Earthing provision has to be such that 25 amp can pass between the earth terminal and every other non-current-carrying metal part of an appliance which may become live in the event of an insulation fault. The potential between the earth terminal and the exposed metal must not exceed 2·5 V (0·1 ohm effective resistance).

Screws and connections are required to withstand tightening tests, applied with a stated torque. All ferrous parts are required to withstand a rusting test.

A feature of the Standard is the list of checks to be applied to determine that the general standard of construction is satisfactory. This covers matters such as the satisfactory fixing of handles and knobs; operation of the appliance when it is at an angle to the horizontal, and the fixing of internal wiring. A check is called for, as well, against accidental change of voltage setting.

Radio Interference in Aircraft

HAVING regard to the extent of the electrical installation in the modern airliner, the wonder is not that there is so much—but so little—interference with the radio transmissions to and from the aircraft in flight. The great dependence of the machine, its crew and passengers on radio transmissions for safe navigation, take-off and landing, however, makes it essential that interference shall be reduced to such levels that even the faintest of signals shall be clearly distinguishable.

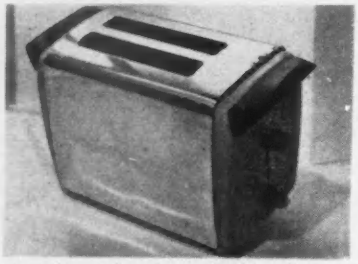
The present stage of interference suppression measures has been reached by the close and co-operative attention to the problem by electrical component manufacturers, aircraft companies, airlines and the various controlling bodies over the years and which first saw official light in the 1948 issue of British Civil Airworthiness Requirements issued by the ARB. This document was the work of an IEE Committee convened at the request of the ARB and, in the succeeding 13 years, the same committee, with the inevitable changes of representation, has constantly reviewed the subject in the light of expanded usage of electrical appliances and services on board and the widening scope of radio communication and navigating systems.

The committee considered that, even now, the issue of rigid requirements of a mandatory nature would be premature but that maintained operational efficiency would best be served by the issue of a Code of Practice for guidance of all concerned with the manufacture, installation, maintenance and operation of electrical equipment on board. CP.1012 (1961) "The Abatement and Measurement of Radio Interference from Electrical Installations in Civil Aircraft," is the result. This gives a survey of the causes of interference, the means whereby it is induced in radio circuits and the means by which it may be suppressed at source. It then outlines the methods of measuring noise voltages both at the terminals of apparatus and at aerial-feeder terminals under specified conditions of test. Six appendices cover the recommended acceptable levels of interference, a summary of characteristics of the measuring sets and representative flight test programmes with other notes of value to those concerned.

new products and appliances

Toaster from Japan

THE introduction of Japanese transistor radios to this country has led to imports of domestic appliances and one of the first of these is the Sharp pop-up toaster. It is a fully automatic model and sells at a reasonably competitive price in comparison with British units. Suitable for standard voltages the toaster is loaded to 800 W and the



Latest import from Japan, the "Sharp" toaster

degree of toasting can be selected by rotating a dial. A lever at one end is used to depress the bread carriage. It has a chrome body with two-tone endplates. The price is £4 19s 6d. *Wholesale Supplies (Swinton) Ltd., 16-18 Worsley Rd, Swinton, Manchester.*

Heated garden frame

THE principle of soil heating by electric cables has been applied to the smaller garden with the introduction of a heated glass frame by Roberts Electrical. It provides 24 sq ft of heated bed with the optional use of warm air, thermostatically controlled to required temperature. The 6 ft by 4 ft frame carries, cleated on its inner walls, fully earthed p.v.c. air-warming cable loaded to 3 kW. It uses a rod-type thermostat and is controlled from an exterior mounted box. Another 1·5 kW soil-warming cable is laid beneath the earth or sand at the base of the frame. Each cable has its own neon pilot light and separate switch on the control box. A half-size model, 4 ft by 3 ft, uses a 1·5 kW air-warming cable and a 0·75 kW soil-warming cable. It sells at £22 10s and the larger model costs £27 10s. *Roberts Electrical Co. Ltd., 11-13 High Rd, Byfleet.*

Immersion heater price up

AN increase in price of the 4 kW non-withdrawable immersion heater is shown in Santon's new price list for domestic appliances. The unit now sells at £4 19s 2d for the 16 in. model and £5 1s 10d for the 36 in. heater. Reductions have been made in the prices of QX/1 domestic central heating units. Prices now range from £10 16s 4d to £18 0s 7d. These prices became effective on 1 Nov. and in all other aspects the list, which covers the months of November, December and January, is the same as the previous issue. The 10% surcharge is included in the purchase-tax figures quoted. *Santon Ltd., Somerton Wks, Newport, Mon.*

Miniature resistance thermometers

SENSING elements of the resistance type and incorporating a platinum wire element, but of such small mass as to be almost instantaneously responsive to slight changes in temperature and, therefore, particularly suitable for monitoring fast heating rates are now available. The surface type, E100A, is mounted on a 0·007 in. metal plate which can be seam-welded, pop-riveted, soldered or cemented to the monitoring surface, is sensitive to rates up to 3°C/sec over a range from −100°C to +250°C. At 0°C the resistance is 100 ohm and the speed of response is less than 0·35 sec.

An alternative model, E130E, has a basic resistance of 130 ohm and an operating range up to 300°C, but both types can be supplied, if required, for higher optimum temperatures.

Immersion type sensors, Types E130 C/D/F, will withstand severe thermal shocks, such as transfer from liquid nitrogen to 750°C enclosures, without changes of measuring accuracy of more than 0·1°C. They are suitable for working pressures up to 3,000 lb/sq in. and can be supplied with sensors down to 0·08 in. dia. *Research and Engineering Controls Ltd., South Bersted, Industrial Estate, Bognor Regis, Sussex.*

Fusible link switch

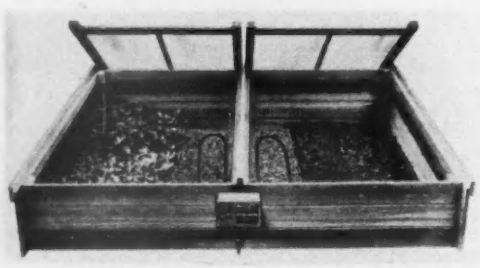
A SAFETY device in furnace rooms and boiler houses is a fusible link switch held in tension by a cable stretched across the room. Excessive temperature rise, such as would be caused by a fire, fuses the link and the switch closes (or opens) to sound the alarm and cut off fuel. Such a device is the V/2A/P. *Craig and Derricot Ltd., Royal Wks, Coleshill St, Sutton Coldfield.*

Encapsulated current transformer

A CURRENT transformer completely encapsulated in epoxy resin insulation has been produced for the GEC for use on the multiple-unit trains operating over the Liverpool St/Clacton line of British Railways. It is mounted on the underframe without any form of mechanical protection or other weatherproofing. The encapsulation was carried out by Permali Ltd. *Permali Ltd., Gloucester.*

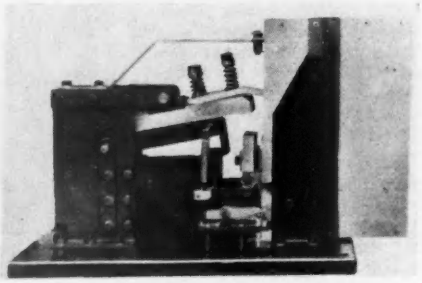
Contactors for heavy duty

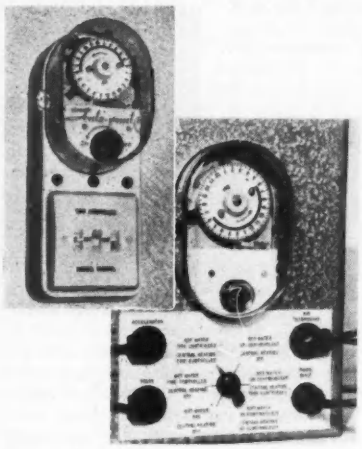
RECENTLY introduced by Bertram Thomas (Engineers) Ltd. is a range of heavy-current contactors to BS 775 covering heavy-duty requirements including a minimum operating life of 5 million operations. Another recent introduction is a fault throwing switch for use in British Railways testing. Spring-powered and arranged to be tripped by a l.v. supply, or mechanically by a lanyard, the switch is designed to close against 20,000 amp at 25 kV, and it has a through current rating of 600 amp. A feature which makes the switch particularly suitable for railway testing use is that it is designed to be broken down into loads capable of being carried by one man. This equipment can be manhandled to the test site without waiting for track possession. Since June of this year, the firm's products have been made in a new 40,000 sq ft works and further extensions to manufacturing facilities are in prospect. *Bertram Thomas (Engineers) Ltd., Worsley St, Hulme, Manchester 15.*



Left: To keep plants warm, the Humex heated frame

Right: This 2,000 amp 600 V heavy duty contactor is by Bertram Thomas (Engineers) Ltd





Two new Venner units: above, the three-switch "Autopoint;" below, the packaged boiler control unit

Venner control units

TWO additions to the Venner range of control units incorporating their well-known time switches are a three-switch "Autopoint" unit for automatic switching of electric heaters and similar appliances and a packaged boiler control unit for gas- or oil-fired furnaces.

The former incorporates three 5 A toggle switches with neon indicators and is intended for small heating installations, comprising boiler heater, pump and fan, the latter accelerating air through ducts to provide warm-air circulation during winter months and cooler air, with the boiler switched off, during summer months. Switching-off the pump enables hot water for domestic uses to be supplied without circulation through radiators or heat exchanger. The second unit incorporates a six-way rotary switch and four sockets for plug connections to mains, thermostat, solenoid gas or oil valve and accelerator pump. Each unit is made dead by withdrawing the plug from the socket, while the switch enables a choice of six economical combinations of time switch and controls to be selected according to the ambient conditions. All switches are rated at 20 A, 200 V to 250 V, 50 c/s a.c. *Venner Ltd., New Malden, Surrey.*

H.F. current measurements

A DEVICE has been recently announced by Dawe Instruments Ltd. designed to provide alternating current measurement, without interruption of the h.f. circuit under test, by means of a "clip-on" probe. Known as the A.C. Milliclamp, type 618, it is used with a valve voltmeter for current measurement or in conjunction with an oscilloscope for examination of waveforms. The "clip-on" probe is essentially a transformer, the primary of which is formed by the conductor under investigation. By the use of a specially developed feed-back circuit the current induced in the secondary and feed-back windings gives a voltage output proportional to the primary circuit over a wide frequency range. Particular feature of this instrument is the current range from a few hundred microamps to 10 A, with a frequency response over 7 c/s to 1 Mc/s.

Applications vary from current determination in magnetic amplifier circuits, to impedance; phase angle and power measurements with a dual channel oscilloscope.

Power can be provided from either a.c. mains or from readily obtainable batteries. The instrument is mounted in a black moulded cabinet with a handle which also forms an adjustable stand. Overall dimensions are 6 in. by 5¼ in. by 8¼ in. and the weight is 5¼ lb without batteries. *Dawe Instruments Ltd., Western Ave, Acton, W.3.*

One electron/sec

IN some research fields the measurement of potentials in low energy fields presents certain problems in that no measuring instrument can operate without drawing some energy from the field. Consequently, the measuring device must itself demand an infinitesimally small fraction of the available energy or it will introduce errors due to voltage- (or microvoltage-) drop across the zone being measured.

A new precision electrometer, the M141, claims to operate at the exceptionally low current consumption of *one electron/sec* ($1{\cdot}602 \times 10^{-19}$ A) when indicating 1 mV. As a voltmeter it provides five scale ranges, 1 mV to 10 V, and as an ammeter with three standard resistors, from 10^{-15} A to 10^{-6} A full-scale deflection. Input capacitance is 1 pF and the maximum charge sensitivity is 3×10^{-18} coulombs.

The M141 is designed for 115 V or 230 V a.c. supplies and operates on the dynamic capacitor principle. Calibration and set zero adjustments can be made without disturbing external connections. Though designed for use primarily in the electronics field it also has uses in chemical, biological and industrial fields. *Wayne Kerr Laboratories Ltd., New Malden, Surrey.*

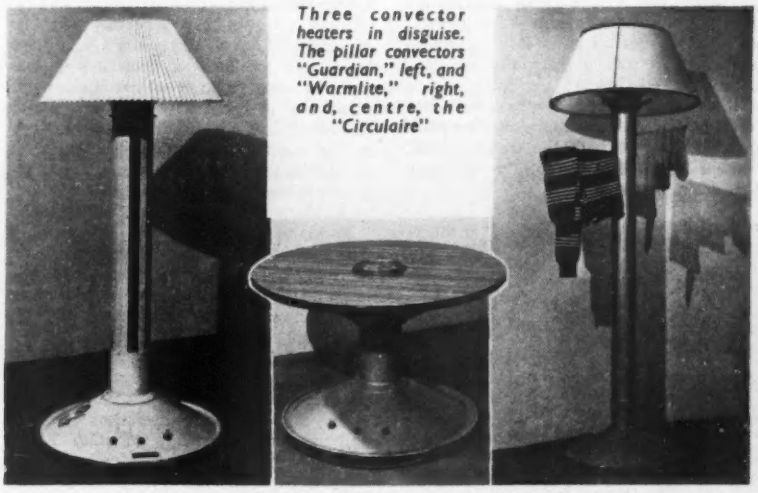
More Appliances in Disguise

THE trend which started a year ago, of making appliances look like pieces of furniture, has been carried to convector heaters by a Somerset firm. They have introduced three heaters, two in the form of standard lamps and the other as a coffee table.

At first glance the "Warmlite" appears to be a lamp, but its fluted column conceals a pillar convector heater loaded to 1·3 kW. By using a set of aluminium rods—available as extras—the unit can be converted into a clothes dryer and a further four arms, on which to hang coats, can be supplied for fixing beneath the lampshade. The heater has a switch in the circular base and is 67 in. high with the shade. It retails at £15 10s including purchase tax.

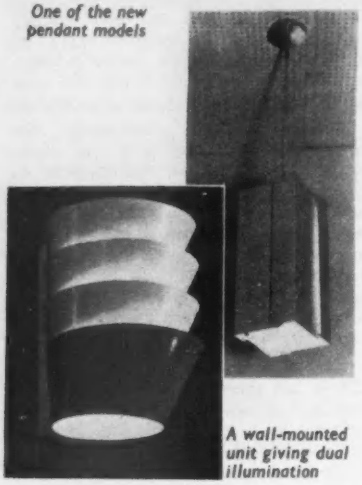
A modified version, "Guardian," is available for use in small flats or nurseries. It has been specially adapted so that the heating element cannot be touched by children or clothing and has an automatic cut-out switch to prevent overheating. It has the same loading as the larger version and can also be used as a reading lamp or nightlight. The price is £12 15s.

Third of this trio is the coffee table, "Circulaire." This has a concealed convector heater rated at 1·4 kW and also a plate warmer when the plastics table surface is removed, revealing an aluminium base. A 750 W hotplate can also be supplied. It retails at 14 gn. The firm are selling these units direct through the retail trade. *Probectors Ltd., East Coker, Somerset.*



Three convector heaters in disguise. The pillar convectors "Guardian," left, and "Warmlite," right, and, centre, the "Circulaire"

One of the new pendant models



A wall-mounted unit giving dual illumination

New range of fittings

WITH the lighting season well under way, Courtney, Pope have introduced several new lines to their decorative domestic and commercial range. There are seven fittings in the series, four intended for wall mounting and three as pendants. Illustrated above is a pendant fitting with a shade comprising four angled metal sides which overlap. The sides are pierced in random patterns allowing light to penetrate. It is designed for use with a 100 W lamp and is 5¼ in. square and 11½ in. deep. Standard finish is anodised gold and it costs £5 13s 6d. The other illustration shows one of the wall-mounted units which consists of four "cones" providing both upward and downward diffusion. The metal "cones" are finished in stove enamelled white and the fitting uses a 60 W lamp. Price in the standard colour is £5 7s 6d including purchase tax. *Courtney, Pope (Electrical) Ltd., Amhurst Pk Wks, Amhurst Pk, N.15.*

Transistorised counter

A NEW counter, the TC1A, is a laboratory grade instrument designed for the measurement of time, period or frequency and the counting of random or regular impulses from 0 to 10^6/sec, giving the count on six in-line projection indicators. It uses a thermally compensated internal crystal oscillator which enables the measurement to commence immediately after switching on. The price is £395 and it is fully transistorised. *Advance Components Ltd., Roebuck Rd, Hainault, Essex.*

Garbage disposers from US

TWO waste disposal units from the United States are being sold in this country under an agreement by Tayco Boilers. They are the Tayco-National Custom 304 and the Super 224. The former is a full-sized cover-controlled disposer with a capacity of 2 qt/load and is equipped with heavy-duty cast grinding plates, said to grind and pulverise waste into micro-size particles. An interlocking cover operates this unit and a twist sets it to "seal," "drain," or "grind." This disposer fits standard sinks with 3½ in. to 4 in. apertures. The Super 244 has power surge reverse gear to counteract jamming and is continuous feed design with 2 qt capacity. Its other features are similar to the Custom 304. Common to both units are dishwasher connections for standard IPS ½ in. pipes and ½ h.p. capacitor-start motors giving 1,725 r.p.m. The Custom 304 is 14½ in. deep and the Super 244 is 12⅞ in. deep. Prices are £42 17s 6d for the Super and £47 12s 10d for the Custom. *Tayco Boilers Ltd., 170-172 Victoria St, S.W.1.*

Tape price cut

REDUCTIONS of up to 10% in prices of both grades of their polythene electrical tape have been announced by Paynes Jiffytape. Cuts are said to be due to increased sales and a policy of specialisation. The company is to reclassify these tapes "5½ thou" and "7 thou," respectively. The new classifications refer to total thickness of tape. *Paynes Jiffytape Ltd., Speedy Pl, Cromer St, W.C.1.*

The new Dawe 1408D noise-level meter weighs only 17 oz

Sound-level indicator

IN these days of increased interest in noise abatement, a useful instrument is a sound-level indicator which can provide a quick and reliable assessment of the general local noise levels. Such an instrument is the new Dawe Type 1408D, which measures 6 in. by 3 in. by 2½ in. and can, therefore, be carried easily in the pocket or hand, but which gives an accurate assessment of ambient noise levels between 64 dB and 110 dB.

The instrument incorporates a sensitive microphone feeding into a high impedance input circuit followed by a four-position attenuator and buffer stage. The output is then applied to a direct-reading meter through a two-stage amplifier and r.c. network, the whole circuit incorporating transistors on a printed-circuit assembly with 9 V dry battery giving some 80 hr of continuous usage. The price is £45 and it is neat, easy to use and clear to read. *Dawe Instruments Ltd., Western Ave, W.3.*

HEAT PUMPS FOR INDUSTRY

THE basic principles of the heat pump are, by now, fairly well known. A number of tailor-made installations have given good account of themselves and many of the earlier miscalculations—which, at one time, tended to discredit the system—have now been rectified. It is claimed that the overall thermal efficiency of the system is of the order of 300%; that is to say, some 10,000 B.Th.U's of heat are produced for every 1 kWh of electrical energy taken by the pump. In a well designed system this figure may be closely approached but, even when the design details are not ideal, something like double the equivalent heat in the electrical energy consumed can be distributed and, moreover, the system is reversible. In hot weather the air can be cooled; in winter it can be warmed.

Fundamentally, the unit is identical with that of a compression type refrigerator and three models have been put into production by Joseph Lucas for domestic, hotel, office or commercial use. The first, "Climasol Model 31," provides heating and ventilating only. The second, "Model 32," provides heating, ventilating and cooling, while the third, "Model 33," is for the really large premises or shop and incorporates a supplementary 6 kW of conventional boost heating.

In each case the pump is a twin cylinder, hermetically enclosed unit driven by a 3 h.p. single- or three-phase motor at 1,440 r.p.m. This circulates the Freon 22 refrigerant through the heat exchangers, expansion valve and compresses the refrigerant after expansion and cooling.

The model 31 is intended for domestic use and does not incorporate a cooling cycle, but has an indoor fan driven by a ½ h.p. motor to provide ordinary air circulation. As a heating device, it will provide about 32,000 B.Th.U's/hr, sufficient for buildings with a floor area of 1,200 sq ft. The model 32 is a de-luxe version of the domestic model and incorporates the full cooling cycle with, if required, a further 3 kW of boost heating for cold days. The larger model also incorporates a ½ h.p. outdoor fan motor and, as stated, a 6 kW boost heater.

All units are supplied ready charged for installation and may be used with or without ducted air distribution. An automatic defrosting system is included and the motor's protection against overload is by high and low pressure cut-out switches. The units are silent in operation. The company will give advice on the application of these heat pumps to particular installations. *J. Lucas Ltd., Gt. King St, Birmingham 19.*

CANADIAN CENTRAL HEATING SYSTEM

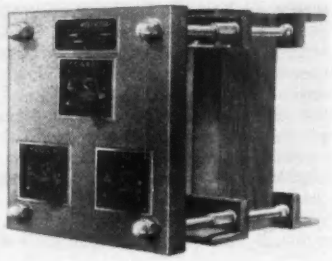
A CANADIAN central heating system using ducted warm air has now been expanded to include an electric furnace as the source of heat. The new model with associated ducting system is said to be suitable for flats and offices and also to be easy to install at fairly low initial cost. This boiler gives 32,000 B.Th.U. and has highly sensitive control. An even temperature is obtainable at required level without overriding the thermostatic setting. This has been achieved by linking the high and low speeds of the circulating fan with the operation of three banks of heating elements.

When the unit is turned on and the thermostat requires a temperature rise, full heat is brought on from all three elements, but the fan works only at low speed to avoid high velocity cold air passing through the ducts and thus causing draughts. Only when air leaves the furnace at 140°F does the fan automatically switch to high-speed working.

After room temperature has reached within two degrees of the thermostatic setting, two banks of elements cut out until a drop of 1°F cuts them in again. This unit is said to be easy to install owing to its ability to discharge warm air vertically or horizontally. This being so, there is a discharge point to connect with the ducting whether the unit is sited on the floor or mounted on a wall. Price of the furnace is approximately £140 5s, and complete installation with ducting is estimated to cost about £250. *Lincoln Furnaces Ltd., Oxted Mill, Oxted.*

Multi-step autotransformers

A RANGE of single- and three-phase autotransformers suitable for the control of resistive loads, such as furnaces, bar heating, anodising and plating, battery charging, motor control, etc., are now available under the name of "Voltmobile," with input voltages of 250 and 440 single-phase or 440 V three-phase and ratings of 30 A, 60 A and 100 A. Each unit provides 64 steps from four each of coarse, medium and fine tappings. Each step gives a 1·6% adjustment of load. The transformers are air-cooled with a front panel incorporating the tapping switches and are rated for continuous duty in ambient temperatures up to 25°C. For special applications a series transformer can be supplied to bridge the fine step giving virtually infinite control. *Harmsworth Townley and Co., Jordan St, Manchester 15.*



A three-phase unit from the "Voltmobile" range of 64-step autotransformers

Transistor ranges extended

HUGHES INTERNATIONAL (UK) announce a major extension of their product lines of high performance p-n-p and n-p-n silicon transistors, sub-miniature glass-encapsulated diodes, cartridge rectifiers up to 30 kV, zener and EIA diodes. Full details will be given on request.

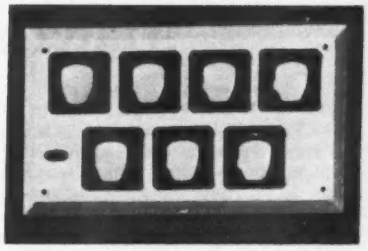
Mullards also announce a new low noise germanium alloy diffused transistor for amplification of frequencies up to 200 Mc/s. Type numbered AFZ12 and in TO-18 encapsulation, it is 5·3 mm long by 4·8 mm dia.

Hughes International (UK) Ltd., Gt. West Rd, Hounslow.

Mullard Ltd., Torrington Pl, W.C.1.

High current transistors

A NEW series of p-n-p alloy-junction germanium transistors, known as the NKT 500 range, have been introduced for amplification, control and switching applications in the industrial and services field. Four ratings are available up to a maximum current of 25 A and for voltages of 30 V and 60 V. *Newmarket Transistors Ltd., Exning Rd, Newmarket, Suffolk.*



Seven-way socket-outlet unit intended for direct connection to a ring-circuit

Multi-way socket-outlet units

A WALL-FIXING seven-way unit has been recently designed for situations where several appliances are required to be used simultaneously. Intended for direct connection to a ring-circuit, it comprises seven 13 A shuttered socket-outlets mounted on a steel, stove-enamelled white board which is earthed by one of the socket-outlets. The internal circuit terminates at insulated connectors to which is run 7/·029 three-core cable through two grommets situated at the back of the board. The unit is supplied complete with fused plugs, screws and Rawlplugs for fixing and is available in a variety of colours. Price, £9 7s 6d.

A six-way board of similar construction has also been announced for connection to an adjacent 13 A socket-outlet, provision being made for a 13 A fuse in the mains supply. Other features are similar to those of the seven-way board. Price, including plugs and cable, is £8 17s 6d. Screws and Rawlplugs of correct length for fixing are provided. *Brydor Products, 373 Battersea Pk Rd, S.W.11.*

TRADE PUBLICATIONS

A.E.I.—Advance data leaflets on Ediswan thyratrons. A.E.I. Radio and Electronics Div., Charing Cross Rd, W.C.2.

BAKELITE.—New edition of "Bakelite Laminated for Gears," of interest to designers and engineers. Bakelite Ltd., Grosvenor Gdns, S.W.1.

BRAY.—Illustrated booklet detailing company's range of ceramic insulators. Geo. Bray Ltd., Leicester Pl, Leeds 2.

BRUCE PEEBLES.—Two leaflets relating to products of the Electronics Divn. of Bruce Peebles Ltd., Edinburgh 5.

CEMENTATION.—Illustrated brochure entitled "Machine Mounting in the 20th Century." Cementation (Muffelite) Ltd., Hersham, Walton-on-Thames.

CENCO.—Pamphlet describing Cenco electronic pH meter. Cenco Instruments Corp., 1700 West Irving Park Rd, Chicago 13.

COURTNEY, POPE.—New leaflet on office lighting showing range of fluorescent and tungsten fittings. Courtney, Pope (Electrical) Ltd., Amhurst Park, N.15.

DOHM.—First issue of "DOHMpowder News" describing products of Dohm Ltd., Victoria St, S.W.1.

D.S.I.R.—Comprehensive illustrated booklet describing silicones at work. D.S.I.R., State Hse, High Holborn, W.C.1.

F. J. EDWARDS.—Catalogue of machine tools stocked by F. J. Edwards Ltd., Euston Rd, N.W.1.

ELGA.—New international catalogue of deionisers. Elga Products Ltd., Lane End, Bucks.

EMI.—Two publications from Electronics Divn., detailing B100 position control system and oscilloscope Type WM16. EMI Electronics Divn., Hayes, Middx.

GERTSCH.—Illustrated 28-page booklet describing 26 models of Wayne Kerr-Gertsch ratio transformers. Wayne Kerr Laboratories Ltd., Coombe Rd, New Malden.

JAS. GORDON.—Pamphlet relating to new electrical automatic control system for shell and small water tube type boilers. Jas. Gordon Ltd., Dalston Gdns, Stanmore.

HILGER AND WATTS.—Section "P" of loose-leaf catalogue now available. Hilger and Watts Ltd., St. Pancras Way, N.W.1.

I.C.I.—Illustrated booklet describing "Integron" high-fin and low-fin tubing. I.C.I. Metals Div., Witton, Birmingham.

MEM.—Leaflet describing new 13 A plug and other plugs by MEM Ltd., Reddings La, Tyseley, Birmingham 11.

NEGRETTI AND ZAMBRA.—Two brochures: one describing recording pyrometers and resistance thermometers and the other detailing centralised temperature indicators. Negretti and Zambra Ltd., Regent St, W.1.

PIFCO.—1961-2 catalogue of domestic appliances. Pifco Ltd., Watling St, Manchester.

REMPLOY.—Illustrated leaflet on heating equipment for domestic use. Remploy Ltd., Edgware Rd, N.W.2.

SIMPLEX DAIRY EQUIPMENT.—Ten pamphlets describing dairy and horticultural equipment by Simplex Dairy Equipment Co. Ltd., Sawston, Cambs.

Materials for Electrical Design

MICRO-MESH METAL

PERFORATED plate in thicknesses from 0·010 in. down to 0·003 in. with holes from 0·027 in. down to 0·003 in. is now available under the name of "Perflec." The metal is pure copper heavily clad with nickel and the holes, which are rectangular in shape, are electro-formed to make a fine mesh. "Perflec" is flat, smooth, tough, and can be cut, punched or bent and the edges will not fray. Standard "Perflec" is produced in rolls 3 ft wide and up to 100 ft long in five counts, producing 15 aperture sizes and thicknesses. *Perflec Dept., N. Greening and Sons, P.O. Box 22, Warrington, Lancs.*

PERMANENT MAGNET ALLOY

PLATINAX II, a new permanent magnet alloy, is the latest in the cobalt-platinum range and, with a BH_{max} of $9{\cdot}2 \times 10^6$ gauss-oersteds, is said to be one of the most powerful permanent magnet materials yet produced. Before the final heat treatment stages, it can be rolled, drawn or machined without difficulty. A data sheet giving details of heat treatment, reversible permeability and behaviour at elevated temperatures, as well as general design data, is available from the manufacturers. *Johnson Matthey and Co., 73-78 Hatton Gdn, E.C.1.*

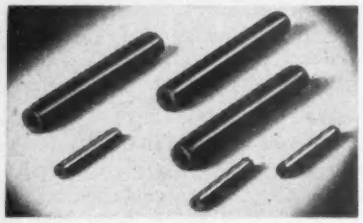
"DURAGLAS" TAPES

A COMPREHENSIVE range of woven glass-fibre tapes has been developed under the trade name of "Duraglas" by Turner Bros. Asbestos Ltd., with the particular demands of the electrical industry in mind. Manufactured from "E" glass yarn with an alkali content of less than 1% (calculated as Na_2O) they will withstand the rigorous service conditions common to generators, traction motors and similar electrical appliances.

They comply with the specification A/S 79 of the Electrical Research Association and. to assist electrical designers in visualising the products, a handy sample card has been prepared and will be sent on request to anyone who may be interested. *Turner Bros. Asbestos Co., P.O. Box 40, Rochdale, Lancs.*

RUST PREVENTION

A NUMBER of coatings for the preservation of metal surfaces from rust or general deterioration in moist atmospheres are generally available, including lanolin-base compounds, dipping oils and plastics-coating films. One of the leading exponents of rust prevention, with several years of extensive research experience behind them, can provide both advice and products. *K. Allan and Co. Ltd., Bream, Glos.*



"Spirol" shock absorbing spring pins with chamfered lead-in

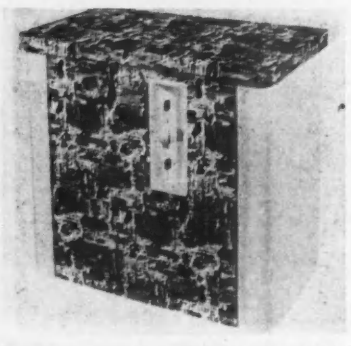
SPRING PINS

A RANGE of "Spirol" spring pins with chamfered lead-in and specially designed for rapid assemblies will shortly be available. The pins absorb shock and vibration, provide uniform flexing and compression, and allow wide hole tolerances. They can be removed as easily as they can be inserted and can be re-used many times.

Made from spirally wound carbon chrome and nickel stainless strip steels, they will be made in sizes from 1/32 in. to $\frac{1}{4}$ in. dia by $\frac{1}{4}$ in. to 4 in long. *Lewis Spring Co. Ltd., Redditch, Worcs.*

TOUGH ALUMINIUM FOIL

A NEW hard aluminium foil is now being rolled in thicknesses down to 0·025 mm (0·001 in.) in grade NS.4, which differs from commercial purity aluminium in that it contains 1·8% to 2·7% magnesium and up to 0·5% each of manganese and chromium. In the hard temper and 0·06 mm thickness, the tensile strength is 16 tons/sq in. to 18 tons/sq in., as compared with 9 tons/sq in. for commercial purity aluminium. The new foil has been introduced to meet a demand for a foil of greater stiffness and strength and it is being used in many industries already. Some of the fields of application are honeycomb centres for reinforced panelling and, at the other extreme, collapsible foil Christmas trees. *Venesta Foils Ltd., Thorn Hse, Upper St. Martin's La, W.C.2.*



One of the more exotic designs in "Stelvetite" as applied to a domestic washer/spin-dryer

ENCAPSULATING RESINS

TO meet the stringent conditions of airborne missile- and space vehicle-service, electronic components are being made in smaller-than-ever dimensions and encapsulated in synthetic resins. Not any resin will serve; it has to have special properties which meet the specific electrical requirements, mechanical strength, chemical stability and ease of application.

One of the most suitable resins are the epoxy range, mixed with "curing" additives for hardening, the choice of additive being dependent upon the degree of heating which may be applied. For example, Araldite D with hardener 951 will cure at room temperatures and is very suitable for small components; for larger components or assemblies which can withstand moderate curing temperatures, other hardeners, such as 960 and 992, may be used.

Araldite resins may be modified by the addition of synthetic resin elastomeric products, such as polysulphide rubbers. In every case, some precautions have to be taken during the encapsulation process to avoid trapping air or voids in the insulation, but the reaction itself does not produce volatiles which could cause bubbles or voids. The electrical components must themselves be dry and free from air and should be warmed in an evacuated chamber for a short period immediately before encapsulation.

The technique is rapidly spreading to other electrical fields and is equally suitable for high or low voltages, small or large assemblies in wet, humid or extremes of hot and cold conditions. *Ciba ARL Ltd., Duxford, Cambs.*

LAMINATED SHEET

A GRADE of bakelite laminated sheet developed for ease of punching, but with good electrical properties is E.18876. Designed to BS 2572, Type P3 and BS 1137, Type 1, its surface insulation is excellent, even after immersion. *Bakelite Ltd., 12 Grosvenor Gdns, S.W.1.*

PLASTICS-STEEL FOR APPLIANCES

THE use of plastics-coated steel, "Stelvetite," for exteriors of domestic appliances has already been referred to in our columns. Under a recent arrangement with the Calico Printers' Association, all patterns in their collection will now be available in Stelvetite. This expansion in colour range presents many possibilities in design. Indeed, the makers suggest that a complete kitchen can be panelled in this material and appliances can be made to match. The patterns are inlaid on a grained surface and colours will not fade. It is a material that is said to be easily cleaned and to have a durable surface. *John Summers and Sons Ltd., Shotton, Ches.*

Power Generation in Orbit

BRITAIN may not have a space programme as yet, but much is being done behind the scenes in a study of the basic problems of power generation suitable for the requirements of vehicles, large and small, in orbit many miles from the earth's surface. As one might expect, the Royal Aircraft Establishment at Farnborough is keenly interested and on Wednesday, 1 Nov., Mr H. J. H. Sketch, B.SC., of the RAE, briefly outlined some of the work which is going on there and in the laboratories of many British manufacturers at a joint meeting of the IEE and Royal Aeronautical Society in London.

The Solar Cell

Despite its low efficiency—of the order of 6%—the silicon solar cell is still the most promising practical device in use in satellites and attempts are being made to improve its output. It is essential for such cells to be used in association with a storage battery since there are zones through which a satellite passes in orbit when the sun is hidden from the view of the cells by other heavenly bodies, such as the earth, or because the satellite, in rotating, presents the face with the cells away from the sun. As for the cells themselves, much of the efficiency depends on the surface treatment and considerable progress is being made with research in this direction.

While theoretically a silicon solar cell should have an indefinite life, in orbit it can be damaged by the impact of micrometeorites and it also suffers deterioration through bombardment by electrons while in passage through the so-called Van Allen belts. Protection has, therefore, to be devised against such damage and, whereas the former is a hazard which can only be estimated, laboratory tests have been developed which simulate the damage by electron bombardment and also the performance of the cell under solar radiation.

For determining the degradation of performance under bombardment, both n-on-p and p-on-n type cells have been submitted to proton bombardment at the RAE and the results plotted. As sources of light energy, both xenon lamps and tungsten filament lamps have been used, the latter at filament temperatures corresponding to 2,800°K and 3,500°K. The range of wavelengths which activate the cell has been established, but experience has shown that outputs obtained with the artificial sources are pessimistic as compared with those from true solar radiation, sometimes by as much as 40%. A truly representative laboratory form of solar source is yet to be established. Nevertheless, as a result of the experiments, information is being obtained which enables the useful life of cells to be predicted with some degree of accuracy in a particular orbit.

The storage cells also have to be of special design since the charge-discharge cycles are totally unlike anything which would be experienced in normal usage. Not only are the number and duration of the cycles random and completely unpredictable, but they have to remain operative with no attendance over periods of months or even years. Specimen cells are the subject of an investigation on automatic testing equipment which applies a series of random charge-discharge cycles to a selected programme.

The problem would be much simplified if the attitude of the satellite in orbit could be controlled so as to ensure that the solar generator surface would always be turned to the sun by some solar-seeking mechanism. Such mechanism is not yet feasible and would add a complication to a device which is already cramped for working space. The designer has therefore to accept the situation and plan accordingly. Moreover, the multi-cell generator has to withstand the tremendous mechanical accelerating forces at "blast-off." Folding arrays, with mechanism for extending them when in orbit, is one way of dealing with this problem.

Nuclear Generators

Other forms of generator were briefly surveyed, most of which owe their main development to American efforts. An attempt to harness nuclear energy to a thermoelectric converter is part of a plan which, under the name of "Snap III," is in an advanced stage of design in the USA. Apart from the very high cost of such generators and the complication of the associated control mechanisms there is always the hazard of a break-up of the device in an abortive launching with consequent wide dispersal of highly radioactive isotopes.

After the lecture there was a brief discussion, to which the author replied.

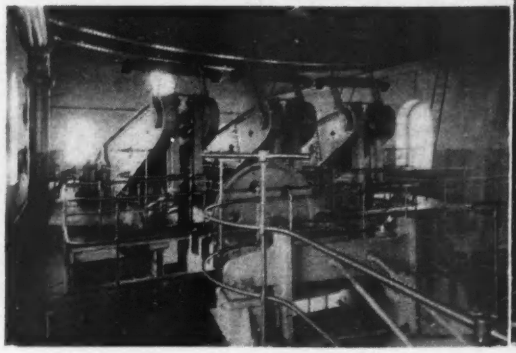
HISTORIC BEAM ENGINES RETIRE

AFTER 15 years of continuous service in keeping the Severn Tunnel free from water, the historic Cornish Beam Engines, built by Harvey and Co. of Quayle, have at last been retired. At an impressive ceremony last Monday the chairman of the Western Area Board, Mr R. F. Hanks, gave orders for the stopping of the first two engines at Sudbrook pumping station and himself started up the electric submersible pumps which are replacing them. Finally, he closed down the third engine so bringing to a close a 75-year period of continuous service in which the beam engines cleared the tunnel sumps of between 14 million and 20 million gallons/day. Of the 12 plunger and bucket type beam engines some will be preserved in their engine houses while the others will be dismantled. From now on, the pumping will be by "Electromersible" centrifugal pumps coupled to 200 h.p. to 250 h.p. 3·3 kV "wet" motors controlled from a central switchboard at Sudbrook. Supply is from the SWEB through duplicate 11 kV feeders and two 1,345 kW diesel-alternator sets provide stand-by facilities.

The four pumping shafts at Sudbrook handle an average of 20 million gallons each day, of which 12 millions is pumped from No. 1 shaft—"Big Spring" water—the remaining shafts dealing with seepage and surface waters from the tunnel mouth at the Welsh end. Next year work will commence on the electrification of the tunnel ventilating system, also situated at Sudbrook, so finalising the modernisation programme. Submersible electric pumps have already replaced the 80,000 gall/hr beam engines at Sea Wall, near Pilning.

The pumps were supplied by Hayward Tyler and Co. of Luton and the electrical equipment and control board by Brush Electrical Eng. Co.

Right, one of the submersible electric pumps which replace the beam engines shown below



News of the Week

Japanese Appliances for Britain

Manchester firm starts with toasters

JAPANESE appliances at competitive prices are beginning to appear on the British market. This follows a comparatively successful début by Japanese manufacturers with transistor radios. One company in particular, the Hayakawa Electric Co. of Osaka, one of the big five appliance makers in Japan, has got a footing in this country in the small domestic equipment range and hope to introduce major appliances in the near future.

A Manchester firm of wholesalers have started to import appliances from this company after distributing their portable radio units. The company, Wholesale Supplies (Swinton), are distributing a pop-up toaster from the Japanese makers and the managing director, Mr C. Sidebotham, told the ELECTRICAL TIMES on Monday that his initial stock of 100 toasters was eagerly snapped up by local retailers (see page 696).

The wholesalers are hoping to import some of the larger appliances from Hayakawa such as the electronic cooker due in about seven weeks time.

The Japanese manufacturers have a comprehensive stock of domestic appliances under the trade name of "Sharp." Some of them are not competitive with British goods, but they could present a challenge with dishwashers, washing machines, vacuum cleaners and garbage disposers.

Import quotas on Japanese goods do not apply to the majority of domestic appliances. With the exception of sewing machines and transistor radios/gramophones, import is unrestricted. However, talks are at present progressing with regard to future arrangements.

B.S.I. Reorganises

CHANGES in the organisation of the British Standards Institution should improve the efficiency with which the increasing amount of technical work is handled. The number of sections between which the work is split is being increased from five to seven by the creation of divisions dealing with metallurgical and some engineering industries, and consumers and safety standards. Codes of practice work is being combined with building activities.

As a result of the changes, several of the BSI staff receive promotion. A note on some of those concerned appears on page 692.

LIQUID GAS THREATENS ELECTRICITY

THE Gas Council has been given the go-ahead to import liquid methane from North Africa, MPs were told last Friday. This means that gas manufactured from imported methane would be available at about 8½d a therm—considerably cheaper than the present price.

Liquid gas will be brought to this country in two tankers to a terminal at Canvey Island. These two ships, together with refrigeration plant, in North Africa are likely to cost some £18 million. Supplies of liquid methane will probably account for one tenth of total supplies of town gas.

The Minister of Power said that this plan will in no way prejudge the building of a Lurgi plant for obtaining gas from coal if such plant promises to be competitive. A joint committee has been set up between the National Coal Board and the Gas Council to discuss this prospect and their report, which will probably be submitted within two months, is likely to show no difference in cost between gas from liquid methane and gas from the Lurgi principle.

Underfloor Heating Adds £2 to Rates

THE additional amenity of underfloor electric heating is worth another £2 on the rating assessment of bungalows, in the view of the Rating Department of Lymington, Hants, Town Council. Members of the New Milton, Barton-on-Sea and District Ratepayers' Association recently decided to protest to the Council on the matter, urging that the additional amount be deleted. It was stated that two residents in such bungalows had already quite rightly obtained a £2 reduction in the assessment, and this should apply to all bungalows in Western Avenue, Glen Close and East Close.

Singer Stretch Out

THE plan to extend the Singer Sewing Machine Co.'s business into the domestic appliance sphere was reported in our pages some months ago. Now, two of their new-style shops, at Brighton and Newcastle upon Tyne, are showing the results of this product diversification. In addition to washing machines (made by AEI-Hotpoint Ltd.) under the Singer name, there are hairdryers, food mixers, space heaters, shavers, floor polishers, tape recorders and electric blankets, all by well-known manufacturers.

£14m. Plant Orders from N.S.W.

THE Electricity Commission of New South Wales has just placed orders for the plant for the new Munmorah power station. English Electric Co. Ltd. are to supply two 350 MW steam turbines, the first of which is to be in operation in November 1966 and the second a year later. They are 3,000 r.p.m. single line reheat machines similar to those on order for Drakelow "C." The order is worth £4 million.

The order for two 350 MW reheat boiler unit, worth £10 million, has been placed with International Combustion Australia Ltd. These units will be pulverised coal fired, and are designed for assisted circulation. Evaporative capacity will be 2,450 klb/hr, with steam pressure of 2,400 lb/sq in., and superheater outlet temperature of 1,055°F with reheat to 1,005°F.

The Munmorah station is to be built between Lake Munmorah and Lake Budgewoi, about 10 miles from the Commission's Vales Point power station.

E.T.U. RESULTS COMING

NEXT week-end should bring official news of the results of the recent election of the executive council of the Electrical Trades Union. This was indicated by Mr F. Foulkes, president, a few days ago, when he said that inquiries were being made about the likelihood of Mr Byrne's early return. If the general secretary's illness was likely to keep him away for a long time, other arrangements might have to be made about the scrutiny of the returns, but these would have to be acceptable to both factions. Mr Foulkes also stated that he had been refused legal aid for his forthcoming appeal against the recent High Court judgment, and might conduct his own case. He also took the opportunity to deny certain reports about proposals for the union's Rules Revision Conference this month. He said the executive had rejected the idea that election of national officers should be by the annual delegate conference instead of by the membership.

10% E.L.C.B's INOPERATIVE N.I.C. INSPECTORS FIND

ABOUT 10% of the voltage-operated earth-leakage circuit-breakers installed in installations inspected by the NICEIC during the 12 months ended 30 September were inoperative. This estimate is given in the latest progress report of the Council. It is reckoned that about one-fifth of the 8,503 installations inspected were protected by e.l.c.b's, and 157 inoperative breakers were found. In addition, 248 installations were ineffectively earthed in other ways. Altogether 5% of installations were thus inadequately protected.

The Council finds signs in its inspections that contractors generally are applying more effective tests of earthing installations and protective equipment.

Ineffectively earthed installations have been discovered almost always by application of an earth-loop impedance test. The Council considers that the value of such tests cannot too strongly be emphasised.

About a quarter of the time spent by the Council on inspecting installations relates to contractors not yet enrolled, the report reveals. Less than 20% of applicants for enrolment are accepted after a first inspection. About 90% of the remainder make the grade after a second inspection. The balance are rejected. Because of the amount of new work, and the growth in number of enrolled contractors, an interval of more than 12 months between routine inspections exists in some areas.

The progress report expresses continued concern at the effect of smaller lamp bulbs in raising the temperature in fittings. Attention is drawn particularly to IEE Reg. 211B, as it applies to fixed wiring taken directly into the terminals of a ceiling-mounted batten holder or lighting fitting. The NIC considers that contractors should take special precautions when selling such "mushroom" lamps to customers, to guard against their being used in inappropriate fittings.

More Delay for Weights and Measures Bill?

IF the Government make sufficient progress with their programme, they are to proceed with the Weights and Measures (No. 2) Bill in this session. MPs were told last Thursday. The hope was expressed that the Bill would not be delayed until the end of session as happened in the last session when there was no time to introduce it. The Bill includes in its definitions of units, the measurement of electricity concurring with international definitions.

EUROPEAN UNION OF WHOLESALERS

AN exchange of information about the policy of electrical manufacturers in Britain and on the Continent was agreed at the latest meeting of the Executive Committee of the European Union of Electrical Wholesalers. The plan is that each country will thus be well informed and able to work more constructively towards establishing a European market where the electrical wholesale trade would effectively function. Many other aspects of trade of mutual interest were also discussed, and from reports of representatives from each country it was found that while business in installation equipment was expanding, the domestic appliance field presented certain difficulties in each of them.

OFFICIAL PUBLICATIONS

BS 1972. Polythene Pipe (type 425) for Cold Water Services. 4s 6d.

BS Code of Practice: CP 1012. Abatement and measurement of Radio Interference from Electrical Installations in Civil Aircraft. 10s. (See page 695).

NCB specifications: No. 102, Dimensions of Three-phase Non-flameproof Electric Motors, 6d; No. 273, Battery Covers and Battery Casetops for Miners' Cap Lamps, 1s; No. 276, Schedule for Electric Discharge Lamps for General Purposes, 6d.

International Association for the Exchange of Students for Technical Experience. Annual report, and report of IAESTE in the UK for year to September, 1961.

Export Guarantees Bill. HMSO, 5d (see this page).

Export Guarantee Ceiling may be Raised

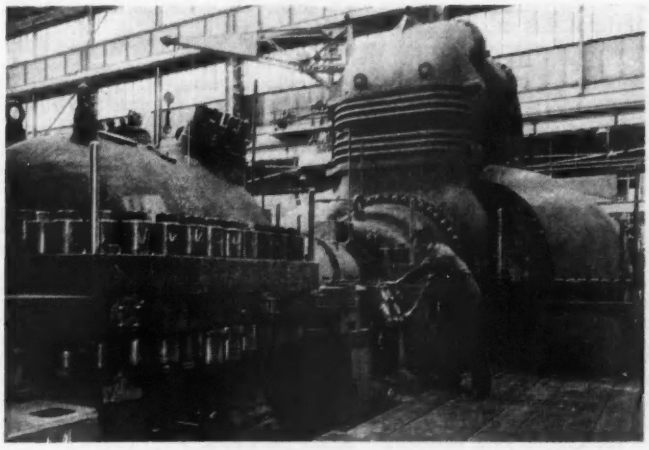
IN view of the expanding credit insurance requirements of British exporters, it is proposed to double the present aggregate limit from £400 million to £800 million. That is the purpose of the Export Guarantee Bill introduced in the House of Commons last week. The Bill also provides for the continuation of economic assistance loans to overseas countries. At 30 Sept. last the actual liabilities of the Export Credit Guarantee Dept. under the 1949 Act, covering business underwritten in the national interest, were about £211 million. There were contingent liabilities of £145 million, leaving a balance of only £44 million.

Setback for Lighting Engineers

LIGHTING engineers who hailed the advent of the Offices Act, and took steps to set out recommendations for office lighting, have suffered a severe setback by the Government's decision to postpone a Bill implementing the Act.

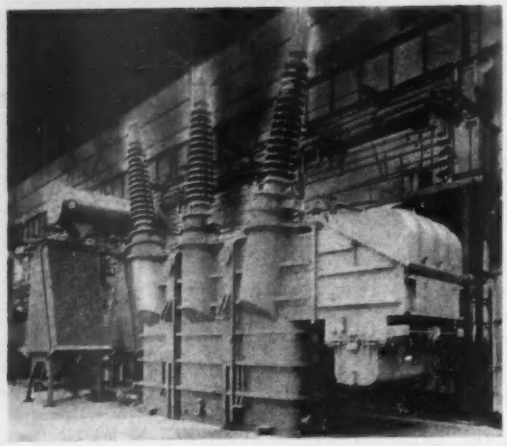
The Minister of Labour told MP's last week that the programme for essential legislation was so full for the current session of parliament that there would not be time for proper parliamentary consideration of legislation required to operate the Act. It had been decided, therefore, to postpone the Government's comprehensive Bill on the subject until the 1962-63 Session. The Act was due to come into force on 1 Jan. next year.

The Offices Act made allowance for standards to be set up for the provision of sufficient and suitable lighting in all parts of the premises where people were working or passing. The British Lighting Council expressed hopes that standards would be laid down higher than present-day standards under the Factory Lighting Regulations. The IES also had recommendations for illumination and glare, but these must wait for at least another year before required legislation is set in motion. When the Act comes into being there is a likelihood that Local Authorities will carry out inspections.



Plant for Poland

A steam turbine for one of the 120 MW turbo-generators being supplied by AEI Ltd. to Elektrim, Poland, on the test bed at the Trafford Park Works



This 35 MVA, 275 kV, station transformer is the first of several being supplied by the British Electric Transformer Co. for the CEGB's Trawsfynydd nuclear power station, North Wales. With tap changing on the neutral end of the high-voltage winding, the transformer is shown completely assembled at the Hayes works with its ON/OFB coolers in preparation for temperature rise tests

Nuclear Engineers Hear of U.S. Developments

NUCLEAR developments at Oak Ridge National Laboratory were recounted by Dr K. Rusk in proposing the toast of the Institution of Nuclear Engineers at the annual dinner last week. He said that the contract given to Union Carbide for the building of the gaseous diffusion plant there in 1943 was unique in including the clause "you assume no responsibility that the plant can be successfully operated." Since then extensive developments had taken place; several reactors were in operation and over one hundred isotopes had been produced. Technetium-99 had been found to be an excellent rust inhibitor and that arch-villain of fall-out, strontium-90, had been used for powering unmanned arctic weather stations.

At Oak Ridge an experimental gas-cooled reactor with 25 MW output was scheduled for this year and an advanced gas-cooled reactor later. They felt, however, that fluid fuel reactors have short-term as well as long-term incentives. In thermonuclear fusion research they had succeeded in increasing the entrainment time for circulating hydrogen ions from a few thousandths of a second to three seconds.

Earlier the president of the Institution, Sir John Duncanson, had referred to the growth in membership which was now 1,100 compared with 700 last year. Mr D. S. Watt, vice-president, replied to Dr Rusk and on behalf of the guests a reply was given by the Rt Hon George Brown. Mr Brown particularly stressed the importance of marine nuclear propulsion to this country. We must be leaders in this field and not wait for others to prove in practice what we had found first, he said.

Another G.E.C. Change

ALL export operations of GEC's Installation Equipment Group will be conducted at Perivale, as from this week. Although the IE Group's headquarters are at Wolverhampton, and remain there, the export side has been conducted from Magnet Hse. Now the address for these export activities becomes GEC, Installation Equipment Group, Export Division, Hosenden La South, Perivale, Greenford, Middx; tel. Alperton 2831.

Excavators Damage 88 Mains in North West

THE frequent damage to high voltage underground cables by mechanical excavators used by civil contractors was referred to at the recent meeting of the North Western Electricity Consultative Council. The Electricity Board's report states that electricity supplies were interrupted 88 times last year by these excavators. Questioned on the matter, Mr T. E. Daniel, Board chairman, said there were several firms responsible for the trouble. They were covered by insurance for themselves, but that did not cover the inconvenience to consumers.

Law Courts change to a.c.

IMPROVED lighting and conversion of the supply from d.c. to a.c. has been undertaken as part of the first phase to modernise the heating and electrical system in the Royal Courts of Justice.

Work began in August 1959 and was completed in September this year, but it had to be closely timed since the major alterations had to be completed during the 2-month summer vacation. The installed electrical load is about 400 kW and it is provided by three main m.v. panels. From these panels, pilcswa cables run through trenches and in the basement corridors to sub-main fuseboards placed at selected riser positions. The final distribution boards on each floor are fed from these sub-main boards through v.r.i. in conduit. During the last year of the scheme, the existing substation at the Strand end of the building was supplemented by a new substation at the Carey Street end.

The heating system installed replaced nearly 300 open fires and it is divided into four zones with electrically driven pumps in each zone.

T.I. STEP UP RESEARCH

THE research and development organisation of Tube Investments Ltd. is being further expanded under its new head, Dr J. M. Kay. The central organisation will consist of a newly formed Engineering Development Design Office (concerned with advancing the specialised engineering of process plant), the Metallurgical Research Laboratory at Hinxton Hall, near Cambridge (concerned with physical metallurgy and metal physics), and a Department of Technical Information in Birmingham.

There is to be a new Iron and Steel Research and Development Department, with headquarters at Rotherham, and a new organisation for the Steel Tube Division developed from the technological centre at Walsall. The British Aluminium laboratory at Gerrards Cross will continue. Development work in the Electrical Division will be carried out mainly by the companies concerned.

HALIFAX CASE GOES TO LORDS

THE CEGB is to appeal to the House of Lords in its claim against Halifax Corporation for £34,500 transferred from the Corporation's electricity undertaking into the general rate fund suspense account when the industry was nationalised in 1948. Notice to this effect has now been given to the Town Council, and the latter's Finance Committee have instructed the Town Clerk to take steps to defend the action.

We reported on 13 July last that the Court of Appeal had allowed the Corporation's appeal against a High Court decision that the £34,500 must be repaid to the CEGB. The Board contend that the sum is part of the assets of the Corporation's former Electricity Department and, as such, should have been transferred to the Board on nationalisation. They maintained that the cause of the action did not arise until 1958 when the Minister of Housing and Local Government decided that the money was held by the Corporation as undertakers.

In the Court of Appeal the Lord Justices held that the time in which the writ should have been served expired in 1954. It is this vital point that the Board challenges.

I.E.E. BYE-LAWS CHANGED

PROPOSALS to change the bye-laws of the IEE were approved by an overwhelming majority of members attending a special general meeting last week. The main purpose of the changes is to permit a new arrangement of what has come to be called the learned society structure of the Institution. The changes now have to be approved by the Privy Council to become effective.

As a result of the changes, the Institution will, from next session, operate in three divisions (electronics, power, and science and general) instead of the existing four specialised sections. Each division will have an elected board, which will provide a driving force behind a number of "professional groups" concerned with specialised subjects. The affairs of the professional groups will be handled by committees appointed by the divisional boards; but the boards will be elected by the membership. Five members of each divisional board will be members of the council of the Institution.

Members of the Institution, other than students, will be able to register as members of the divisions that interest them, provided that, in the case of the electronics and power divisions, they can demonstrate an appropriate specialist interest. (It appears that some members are concerned about this last provision. Detailed regulations concerning it have yet to be published.) Members will also be asked to indicate the professional groups they wish to be associated with in the new arrangement.

Under another change in the bye-laws, the IEE Council is in effect given the power to increase entrance and subscription fees, subject to confirmation later at a special general meeting of the Institution, without the need to have the change allowed by the Privy Council. There are other minor changes relating to members who change their name, and to reduced entrance fees for some classes of member.

More All-electric Flats for Glasgow

A £2 MILLION all-electric housing development at Broomhill estate has been approved by Glasgow Corporation's Housing Committee. To provide accommodation for 683 families, the scheme will consist of five 18-storey blocks, three of eight and three of four storeys. The flats will be all-electric with underfloor warming. The estate is to be developed by the Scottish Special Housing Association. Overlooking the Clyde, it is described as one of the most attractive post-war housing projects in Glasgow. Work on the scheme is to be spread over four stages, commencing next year with the building of four of the 18-storey blocks.

New Wiring Regulations Edition Planned

PREPARATION of a revised fourteenth edition of the IEE Regulations for the Electrical Equipment of Buildings has been approved by the Council of the IEE. All users of the regulations are invited to submit comments on the present (thirteenth) edition to the Secretary of the Institution. Comments are asked for not later than 1 January, 1962. No forecast of when the fourteenth edition will be published is possible, but the Council have stated that the date will not be before the end of 1962.

Since the thirteenth edition was published, it has been the subject of two sets of amendments, the second of which is reviewed on page 683 of this issue. When the Wiring Regulations Committee gets to work on the fourteenth edition, matters that have been commented on in official interpretations on thirteenth edition regulations will automatically be considered. So there is no need to draw further attention to them. Nor is there need for past inquirers, who have been informed that their comments will be further considered for the fourteenth edition, to write again.

It is almost 80 years since the first IEE Wiring Rules were published. They were drawn up by a committee which did not contain direct nominees of bodies other than the IEE. The present committee contains, besides the chairman and 12 members appointed directly by the IEE Council, 32 members nominated by interested organisations.

"I Got it Cheap at an Auction"

WELDING sets, described as "very risky pieces of apparatus," were the subject of an action at Walsham (Norfolk) Court recently when Mr A. G. Davey pleaded guilty to seven charges of obtaining nearly £44 from various auctioneers by false pretences. He was sentenced to 12 months' gaol. For the prosecution it was alleged that Davey made the welding sets and put them into auction sales. Each set consisted of a biscuit tin which had been carefully sprayed and fitted with a dial, some terminals and leads. Inside was an assortment of rubbish, including wood, cardboard and bits of back axles. A consulting engineer told the Court that seven electric welding sets he had examined not only did not work, but in certain circumstances could cause injury or death by electrocution. Defendant's solicitor said Davey did not realise he was breaking the law or endangering anyone's health.

APPOINT MINISTER OF PRODUCTION, SAYS ENGINEER

AT least among those responsible for production, it seems, bureaucracy is not regarded as overblown. Within a week of EDA's Mr Goodman suggesting that the Government should set up a Department of Automation, the president of the Institution of Production Engineers, Mr H. Burke, has put forward the idea of a Minister of Production. Addressing the IPE annual dinner, Mr Burke said the minister, who should be an industrialist, would advise and if necessary direct industry.

Turning to technical education, Mr Burke said he believed that there should be a First Degree Course in production engineering. The education theme was taken further by the guest of honour, Lord Chandos, with two principal suggestions: first, that the situation should be corrected where a boy has to choose between the humanities or science and engineering at "far too early an age," this to be achieved by including more science and mathematics in the humanities curriculum; secondly, that it would pay industrial companies handsomely to give scholarships in general industrial management to engineers who will have to face those complexities.

NEW SHOWROOM AT ABINGDON

Exterior view of the new Abingdon showrooms of the Southern Electricity Board, which have electric floor-warming throughout. At the rear is a large stockroom and two offices, with further offices on the upper floor

LYDD–BOLNEY LINE INQUIRY

MUCH of the proposed supergrid line from Lydd, Kent, to Bolney, Sussex, should go underground. That was the not unexpected main contention of the principal objectors to the proposals at the public inquiry which opened at Lewes last week. The CEGB were seeking consent to the erection of the line on one of two proposed routes or on a combination of both. That tentatively chosen by the Board would be 52½ miles long and cost £3·9 million, while the other, suggested by Miss S. Crowe, landscape artist, on the briefing of East Sussex County Council, would be 2¼ miles longer and cost an extra £137,000. There were several objectors to one or other of the alternatives.

For the Board, Mr H. B. Dreyfus, system design and development engineer, said suggestions had been made for a submarine cable from Dungeness to Brighton, but the cost of £34 million was prohibitive, and the cost of underground cables was more than £1 million a mile. The plan was for the line eventually to run through to Lovedene and then on to Exeter.

The proposed double-circuit line was intended to be operated at 275 kV initially, but it was anticipated that one circuit would operate at 400 kV from 1966 and the second about 1968-70, Mr S. B. R. Cooke, for the Board, explained.

At the second day's hearing much of the controversy centred round the proposals to take the line north of Rye as suggested by Miss Crowe. The latter opposed a route through the Rother Valley, favoured by the CEGB and East Sussex County Council and instead proposed that it should pass over the tail end of Rye Hill slightly nearer to Rye. The National Parks Commission also considered it important to safeguard the character of the Rother Valley.

For the Council for the Preservation of Rural England, Mr C. S. Chettoe suggested that the part of the route near Rye should be underground, but several other objectors including Kent and East Sussex County Councils, Hailsham, Uckfield, Battle and Chailey Rural Councils urged that much of the line should go underground. The Decca Navigation Co. complained that the line might interfere with transmission from their East Hoathly station. The hearing was continuing on Tuesday as we went to press.

Refrigerator Decline Seasonal Only

REFRIGERATOR deliveries to the home market in September compared less favourably with those of the corresponding month last year than was the case in August, but manufacturers are still fairly happy at the way things are going. Dealers' stocks are diminishing and public demand remains good, DORDEC report. September's UK deliveries totalled 23,128, which was 15% below September, 1960, whereas the decline in August was only 2·6%.

Exports, however, are giving more concern. After coming within 2·5% of last year's level in August, they slumped again in September to 28% below the line. Taking the first nine months of 1961 as a whole, exports are down 6·3%. Home deliveries, although 13·7% below record-breaking 1960, are 3·4% higher than in 1959.

. . . other durables

RETAIL sales of durable goods generally were also lower in September compared with the July-August level. The seasonally adjusted BoT index fell to 107 from 115 in August and 130 in pre-Little Budget July.

Electronics Article Competition

EIGHT premiums of 30 gn each are being offered for articles which are likely to publicise throughout the world the valuable and original work taking place in the UK in radio, electronics and associated instrumentation. The scheme, sponsored by BREMA, the BRVMA, the Electronic Engineering Association and the Electronic Valve and Semi-Conductor Association, covers technical or commercial articles published in any journal which is available to the public generally. Other details are available from the Electronic Engineering Association, 11 Green St, W.1.

Conferences to Come

SCIENTIFIC instrument manufacturers will concentrate on exports at their association's annual convention at Eastbourne next week. They will investigate opportunities within the context of only about 25% of Britain's output of scientific instruments being exported, and this contribution coming from only about a quarter of the firms in the industry.

On the Common Market, Mr A. W. Jones, president of SIMA, says it must not be forgotten that there is a much greater market for British goods outside the Continent. Joining the Market would not enable instrument makers to sit back with orders pouring in.

★ ★ ★

THE place of electric steelmaking in the energy balance of an integrated iron and steelworks will be amongst topics considered at the autumn general meeting of the Iron and Steel Institute, to be held from 29 Nov. to 1 Dec.

★ ★ ★

A SYMPOSIUM on the mathematical theory of automata is to be held in New York City from 24 April to 26 April, 1962. Sponsored by the Polytechnic Institute of Brooklyn, along with the Institute of Radio Engineers, the American IEE and the US Defense Research Agencies, the symposium will emphasise the application of mathematical techniques to information handling systems. Closing date for the submission of contributed papers or abstracts is 5 Jan. next.

E.D.A. AT THE HOTEL FAIR

EDA's stand at the British Hotels and Restaurants' Association Trade Fair at Torquay. The Association concentrated on showing up-to-date electrical equipment for the hotel kitchen, and the comfort electric heat and air-conditioning can bring to the hotel lounge

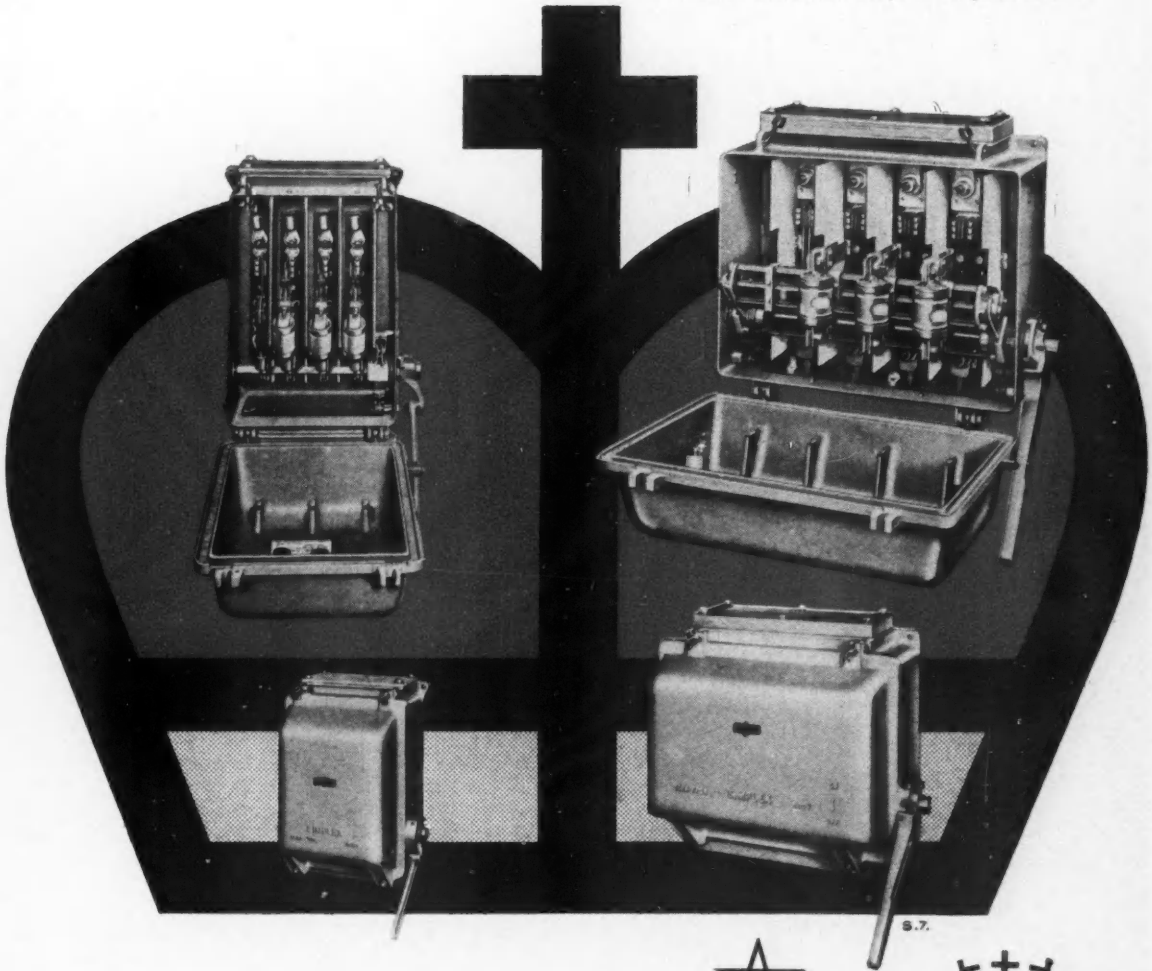
Single-tank Breaker Tested

THE new single-tank 132 kV oil circuit-breaker made by AEI Ltd. has been proved for 2,500 MVA at 132 kV. The short-circuit tests were carried out at the Switchgear Testing Co., at Manchester. This type JB 431 breaker requires only about 1,000 gallons of oil; has all three phases in the one tank and no interphase barriers; and maintenance can be carried out on all three phases simultaneously, irrespective of weather conditions. It is claimed to have an impulse withstand level of 650 kV.

Among the first orders is one from the CEB, of Malaya, for 17 132 kV, 2,500 MVA units for the Cameron Highlands scheme, and another from New Zealand for four 110 kV, 1,500 MVA units.

SIMPLEX MONARCH SWITCHGEAR- THE HEAVY DUTY RANGE IN THE SIMPLEX RANGE OF SWITCHGEAR

The robust, all-cast Monarch range of switches and fuse switches is primarily designed for heavy duty industrial work.
The casing is of weatherproof cast iron construction. The operating handle is interlocked with the cover. Provision for locking the cover or handle is also provided as standard, and handles can be supplied arranged for Castell interlocks.
Adaptor troughs are available for mounting on trunking and busbar chambers, and sealing chambers and glands for Monarch units are made to fit any type and size of normally used cable, either straight or reverse entry without drilling.
Monarch fuse switches 150, 300 amp. 500 volt.



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Complementary Simplex Star range. Economically priced, front operated switchfuses in 15, 30, 60 amp. 500 volt. Busbar chambers 200, 400, 600 and 800 amp ratings. 600 volt. Distribution fuseboards 15, 30, 60 amp. 500 volt.

Complementary Simplex Regent range. Robust, stylish switchfuses, 15, 30, 60 and 100 amp. 500/600 volt. Busbar chambers 350, 550, 800 amp. 600 volt. Distribution fuseboards 15, 30 amp. 500 volt.

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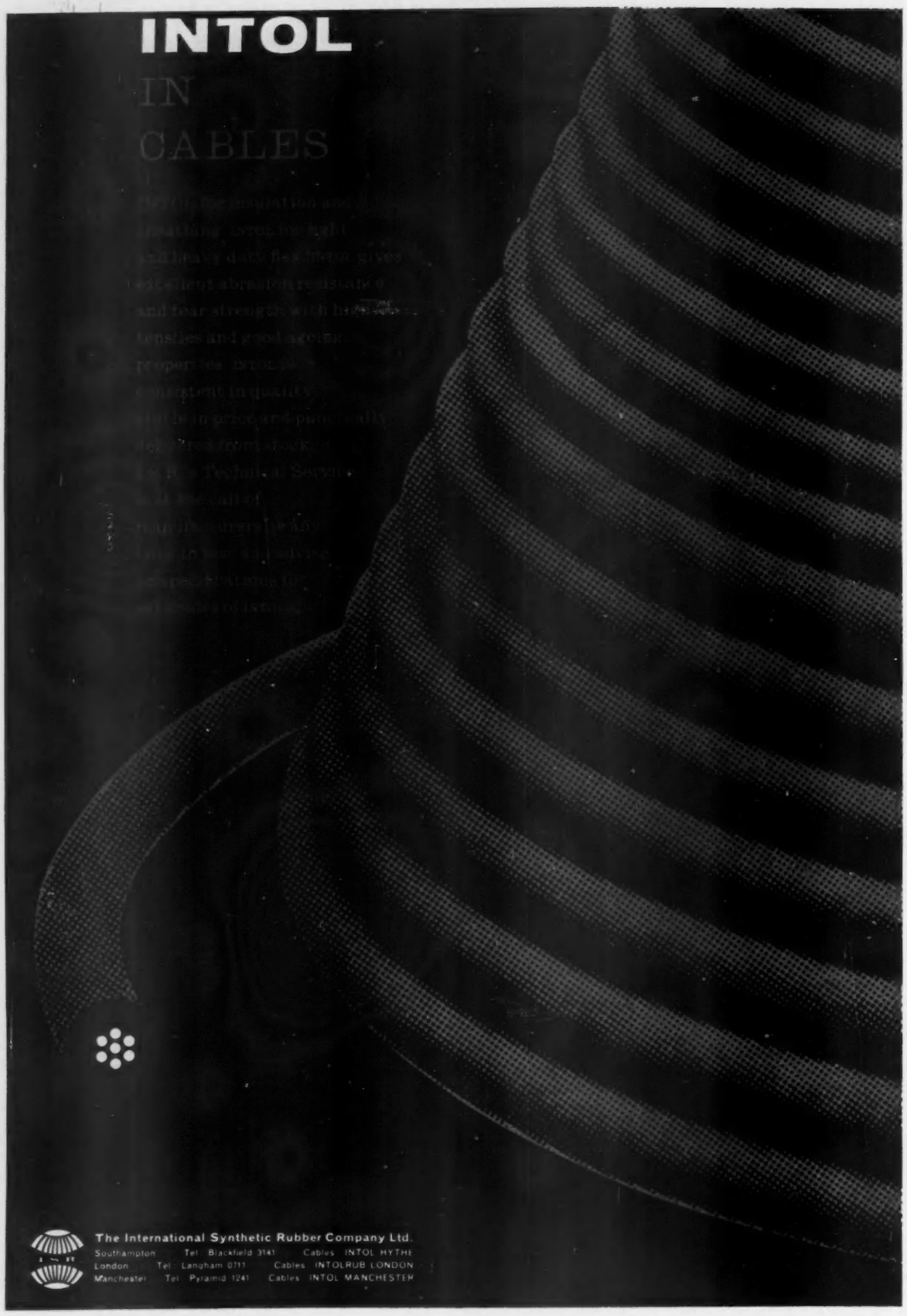
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Less Rigidity for I.E.E.

THERE were 150 members and guests present at the IEE Merseyside and North Wales Centre annual dinner in Chester on 6 Nov. Mr O. W. Humphreys, C.B.E., B.SC., M.I.E.E., vice-president of the Institution, spoke of the new constitution. This aimed at removing the rigidity of the previous structure and was necessary because of the increasing movement of the frontiers of science.

New developments would come into the centre where scientists would study them and move them out towards their appropriate division of either power or electronics. Members of the Institution would be able to join either or both of the divisions in which they were interested.

Speaking of the centre, the vice-president said they had been concerned with means of improving attendances at meetings. There were two extremes. One was a need to provide facilities for specialists to get together, and here the success of the idea would be determined by the quality of the discussion more than by the numbers attending. He personally felt that 12 should be the top limit. On the other hand, a solution had to be found for the members who wished for further education, and here the broadest appeal would be made by first-class lecturers. Talks about the "fringe" areas of electricity would result in bigger meetings.

Mr Humphreys was replying to the principal toast proposed by Sir John Charles Nicholson, T.D., F.R.C.S., B.M., B.CH., consulting surgeon at Bethnal Green, St Leonards and St Matthews hospitals, London. The toast to The Guests was made by Mr D. A. Picken, M.I.E.E., past chairman, and the response by the Mayor of Chester, Alderman Beryl Nield.

Sayings OF THE WEEK

"The producer should be rather regarded as the principal source of our wealth, someone even to be wooed and not only exhorted and warned, someone even to be cosseted a little, and not always to be exposed with gusto on the Spartan model." . . . LORD CHANDOS, at BEAMA Golden Jubilee dinner.

"We have been asked to choose over the two routes and that has placed the County Council in the position of a man in the condemned cell who is given the freedom of choice whether to have his neck broken or throat cut." . . . MR R. MCVARISH, for Kent CC, at Lydd-Bolney line inquiry.

"Share ownership is still regarded by some as a rather dubious sort of 'spivvery.' Others think of it as a mere status symbol. It is neither, of course. It is just the obvious and sensible way of employing spare money." . . . LORD RITCHIE, speaking in Manchester.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, November 7

	£ per ton	Weekly change £
COPPER, standard class A (settlement) ...	231	+3
" (3 months)	231½	+2½
LEAD, refined pig, 99·97% purity (cash)	61½	+½
" (3 months)	62½	—
TIN, refined, min. 99·75% purity (settlement)	970	+6
(3 months)	968	+4
ALUMINIUM, ingots 99·99·5% ...	186	—
" wire bars (4×4×54")	193½	—
BRASS Strip 63/37	195½	—
SILVER (Troy oz)	80d	—
ZINC, virgin, min. 98% purity (cash)	70½	−1½
" (3 months)	71½	−1
RUBBER, per lb		
No. 1, RSS, spot	22½d	−¼d
c.i.f. basis, ports, Jan. ...	22½d	−¼d
ARMOURING:		
Galv. Steel Wire (0·104 in.) ...	68½	—
Mild Steel Tape (0·04 in.) ...	53½*	—
NICKEL (home)	660	—
MERCURY (76 lb flask)	60	—
AMERICAN PRICES:		
Copper, electrolytic (per lb) ...	31c	—
Lead (New York)	10½c	−¼c

* *Tape Price, now an average, includes varnishing*

LARGE CONTRACTS AWARDED

AN order for the 1,450 s.h.p. twin-screw diesel-electric propulsion installation for the new district tender vessel to be built by J. Samuel White and Co. for Trinity Hse has been placed with the English Electric Co. Valued at over £120,000, the plant will include four six-cylinder main engines, driving d.c. generators, arranged in a series-sandwich circuit with two 725 s.h.p. 460 V 228/205 r.p.m. propulsion motors. A modified Ward-Leonard control system, operable from the bridge or engine-room, will be installed. Each main generator will drive a 75 kV auxiliary set.

THE BBC has placed an order with Marconi's Wireless Telegraph Co. for ten 250 kW short-wave sound broadcasting transmitters of a new type which should improve overseas reception.

AMONG orders, valued at £170,000, recently received by the AEI Motor and Control Gear Division is one from Foster Wheeler and Co. for 120 motors, ranging from ¼ h.p. to 4,000 h.p., together with h.t. and l.t. switchgear for a new butyl rubber plant at the Esso Refinery, Fawley.

New Committee for Specialist Engineering Contractors

THE Electrical Contractors' Association is one of three founder members of a new body set up to deal with matters of common interest to industries engaged on specialist engineering work on building and civil enginering projects. The new organisation, entitled the Committee of Associations of Specialist Engineering Contractors (CASEC), is the culmination of several years of informal co-operation between the founder members. Other members, with the ECA, are the Association of Heating, Ventilating and Domestic Engineering Employers, and the British Constructional Steelwork Association, but membership is open to any trade association representing specialist engineering contractors in the building and civil engineering industries.

O.H. lines for the layman

THE basic factors governing the design of overhead transmission lines as used on the grid and supergrid systems are explained in layman's language in a new booklet "Network for the Nation," just published by the CEGB. Written by Mr G. B. Jackson, formerly the Board's overhead lines engineer, it is not intended as a justification for the use of these lines, but is purely informative.

News in Brief

The Goodwin illuminated fountain in front of Sheffield's Town Hall was switched on by the Lord Mayor, Ald J. W. Sterland, last Thursday.

The Midland branch of the ETCTA held their annual dinner at the Pavilion Suite, County Ground, Birmingham, last Friday.

Annual general meeting of the Electrical Wholesalers' Federation will be held on 22 March at Park Lane Hotel, and the annual dinner that evening at the Dorchester.

The Equipment Division of Submarine Cables Ltd. has supplied all the cable-handling machinery and ancillary equipment for the 4,000-ton French cable-laying and repair ship *Marcel Bayard*.

The annual ball of the AEI Willesden switchgear factory Social and Athletic Club on 27 Oct. was attend by some 300 members and friends.

Following their cocktail party to launch their new works at Southall, Arrow Electric Switches Ltd. entertained 200 customers and friends at the Queen's Hotel, Birmingham, on 1 Nov.

Mitsubishi Atomic Power Industries Inc., of Tokyo, are to make nuclear reactors and associated plant under an agreement with Westinghouse Electric International Co.

The first ten electric trains were re-introduced on the Fenchurch St-Tilbury-Southend line this week.

Company Activities

BANK Rate down once more, the second time in four weeks, from 7% to 6½% and now to 6%—but the prospects for equities are scarcely any less obscure than they were a month ago. More light, however, is now available on some aspects of the country's external monetary situation with the publication of the October gold figures, and they certainly show why the £ is riding high on the foreign exchange market. The Sterling Area's gold and foreign currency reserves in fact recorded an £8 million fall last month, but as this was after special repayments of at least £120 million, including the £100 million repayment to the IMF (it compares with total reserves of only £1,261 million) it can be seen just how big a carrot a 6½% Bank Rate can be however moth-eaten the appearance of the economy. Even at 6%, we can still expect a flow of foreign funds into London, albeit at a slackened pace, so that fixed-interest paper and Government stocks still present themselves on the short term as safe and lucrative havens for investment funds.

Inasmuch as a strong £ lessens the probability of any sterling devaluation the prospects for British manufacturing industry are less bleak than they could be, but this thought together with the Bank Rate cut brought no particular joy to the equity market last week. Share prices had in fact climbed higher before the widely expected Bank Rate decision but this leavening must be comprehended in terms of a technical rally after the market had fallen to a recent 1960-61 "low" rather than as any result of cheaper money. After the 6% announcement, equity prices actually slipped back for the most part but only because another factor was operating, the stream of incoming company news which continues to tell its dreary tale of setback.

The Bank of England, too, has made it quite clear that the "squeeze" goes on; export prospects cannot be described as any great deal brighter than they were a month ago, and there is now talk that the US business recovery is not the firecracker miracle it was first thought to be. In the foreseeable future the brightest prospect for each and every equity investor is his Christmas dinner.

A few "fairy lights," however, were twinkling in the electrical share market. Dimplex, the heater firm, switched up from 54s to a new all-time "high" of 55s 3d, and Decca saw their Ordinary shares spin up from 58s 3d to 60s 9d and the "A" Ordinary from 55s 9d to 59s 3d. The three "giants," too, were in better shape, with AEI gaining from 29s 9d to 30s 6d. GEC, after investment comment, was up from 25s to 26s 6d and English Electric edged forward from 27s 6d to 29s. Crompton Parkinson on further consideration after the results generated a further 6d rise to 12s 9d and Ultra recovered from 17s 3d to 18s 7½d. EMI, Elliott Automation, Pifco, Birmingham Sound Reproducers and Plessey were all others to take on a little extra shine. With Plessey, the "old" 10s shares started out the week at 38s 3d and finished at 42s 6d while the "new" issued on the Automatic Telephone takeover rang up from 39s 6d to 42s 3d. ICT were unchanged at 89s 6d on their contract to supply at least 50 computers to Radio Corporation of America.—*From our City Correspondent.*

Contactor Switchgear

A sound recovery in earnings from £124,170 to £181,901 suggests that the benefits of the new factory at Leominster, in conjunction with full order books, have been felt. It would also appear that the purchase of Radio Aids Ltd. in August, which has since been renamed Contactor Switchgear (Electronics) Ltd., has proved anything but detrimental. After tax, profit comes out at £83,037 against £58,209 previously, and dividend stays at a comfortably covered 14%.

Gas Purification and Chemical

No explanation is contained in the preliminary report of a major setback in the year to June. There is a loss before tax of £14,872 in contrast to the previous year's £811,034 profit, and dividend is omitted. To sweeten the pill, directors announce that sale of a leasehold will increase the cash flow by £475,000, of which a substantial sum will be capital profit.

Hilger and Watts

Holding slightly more than half of the shares in W. Ottway and Co., the Ottway family have decided to accept the Hilger & Watts bid. In the formal offer, H & W directors predict a steady 15% dividend this year.

Holophane Ltd.

The virtually steady earnings in the past year were from a higher volume of business, the directors reveal in their report with the accounts, with higher costs offsetting the advantage.

Year to 30 June	£ Trading Profit	£ Net Profit	% on Ord.		Ord. Price*	
			Earned	Paid	High	Low
1957	143,615	56,399	65·4	37½	16/1	11/1
1958	121,576	49,338	34·3†	22½†	15/10	12/7
1959	106,001	49,189	32·1	26	21/-	12/9
1960	113,537	52,777	34·5	30	22/3	16/1
1961	114,287	53,946	35·2	30	20/6	15/-

* Calendar year, except 1961 which is up to 20 Sept.
† After two-for-three scrip issue.

Falk Stadelmann

While pre-tax profit is only a shade higher at £235,473 for the year to 31 March, compared with £224,471 previously, dividend is raised from 7½% to 8¼%. Sales have increased in the first half of the new year and prospects are better, the chairman states.

Oliver Pell Control

Contrasting with the £17,068 loss in 1959-60, a profit of £34,239 was earned in the year to March. Dividend stays at 6% but this time it is covered a dozen times by the net profit.

Racal Electronics

The profit figures for the past few years, issued in connection with the placement of shares through Philip Hill, Higginson, Erlangers, show that the company has participated fully in the electronics boom. Since 1956, pre-tax earnings have grown from £13,534 to £182,436, with the Government providing 50% of the custom and exports as the bulk of the remainder. Telecommunications have been the main avenue of operations so far, but a subsidiary is now making a small beginning in automation. In conjunction with the forecast of a 17½% dividend more than twice covered, this looks a promising prospect for those taking up the 300,000 5s shares at 20s.

W. H. Sanders (Electronics)

Having announced a one-for-four issue of 2s shares at 11s each to finance an expansion of production facilities, the company has now found the premises. Mr P. L. Wilde, chairman, told shareholders at the annual meeting last week that a modern factory of 15,000 sq ft was being acquired at Stevenage.

Sterling Cable Co.

Although the cable "war" was dying down during the year to 31 March, the extent of Sterling's recovery during that period suggests that they must have been highly efficient. At £173,034, trading profit is over £42,000 higher than in the previous year and within £16,000 of the peak 1958-59 level, while dividend is edged up by 1% to 7½%. This improvement is continuing, the directors state.

Tube Investments

Results for the year to 13 July are much better than the stock market expected, with trading profit just over £3 million higher than in the previous year at £27,161,023, and profit after tax up from £9,923,838 to £10,364,746 after much higher depreciation. The increase in earnings is entirely due to the main group, which includes the Electrical Division.

Dividends Announced

Bulpitts (*Swan Brand*). Interim 5% (*same*).

Pye (*Ireland*). Interim 2% (*steady*).

Rawlplug. Interim 7½% (*same*).

Simon Eng. Interim 10%.

OVERSEAS NEWS

from our correspondents abroad

CANADA

Two Sets Ordered

A $1¼ million contract has been awarded to the Canadian Westinghouse Co. by the Hydro-Electric Power Commission of Ontario for two generators for the Little Long generating station on the Mattagami River. The machines will have a combined output of 114 MW. The Little Long hydro project, 42 miles north of Kapuskasing, is scheduled for completion late in 1963. The station is one of three to be built along a 15-mile stretch of the Mattagami River which together will supply 356 MW by 1966.

First Peace Contracts

Further evidence that the British Columbia Government is determined to proceed with the Peace River project is the news that two contracts, worth over $540,000, have just been awarded for the construction of a pilot tunnel and a bridge at the site of the proposed dam. The 10 ft square pilot tunnel is to be driven through the west bank of the Peace River about 10 miles west of Hudson Hope to explore rock formation. Beginning in February, three 50 ft dia diversion tunnels 3,000 ft long are to be drilled. This work is to be carried out by McNamara Construction Western Ltd., of Edmonton. Western Bridge and Steel Fabricators Ltd., of Vancouver, are to build a steel-arch bridge to reach 500 ft across Peace River Canyon 120 ft above the river level. This will provide access to the diversion tunnel and other work areas on the river's west bank. By these contracts Premier Bennett has further indicated his earnestness concerning the Peace River project despite threats from Ottawa that the Navigable Waters Act might be invoked. It is also reported from Toronto that the province-owned British Columbia Electric Co. intends to launch a $28 million bond issue early next year.

Another Underground?

After Montreal's decision to have a Metro system (ELECTRICAL TIMES, 26 Oct. issue), Winnipeg is expected to be the next Canadian city to again consider adoption of a similar plan.

Preliminary plans for such a system, calling for the first trains to start running under Portage Ave by 1970, are expected to be presented this month to the metropolitan council, which administers certain essential services—including transit—for the City of Winnipeg and 18 surrounding municipalities. The subway proposal has the support of metro transit director D. I. MacDonald. His objections to a plan for a system of expressways led to a 1959 transit survey by Norman D. Wilson, Toronto consulting engineer. The Wilson report said subways would solve Winnipeg's traffic problems better than expressways. It suggested a three-route system totalling 23¼ miles.

Thermal Power for Quebec?

The likelihood that Quebec, now predominantly using hydro-electric generation, would have to turn to thermal power very shortly was stressed in a brief prepared by experts on behalf of the Quebec Chamber of Commerce last month. Although at the moment the province of Quebec enjoys a comfortable surplus of power generating capacity, he considered that there would have to be a rapid move in the present decade to avert a power shortage. Current plans for new generating installations may be not enough to assure adequate power supplies, and it was suggested that consideration be given to the erection of another thermal plant in the Gaspe region designed to burn coal from the Maritimes.

U.S.A.

Anti-Trust Actions

Latest move in the wholesale Anti-Trust charges being prepared against electrical manufacturers in the US is the formation of an organisation by some 150 private utilities with the object of pooling information and sharing the large legal costs involved in the actions. Some 100 municipal authorities also affected are also forming a similar group. The actions threatened stem from the indictments last April under the Anti-Trust Act. The utilities and the municipal authorities, along with the government agencies, are preparing claims for damages against the suppliers of various electrical equipment. They will claim that under the firms' price-fixing arrangements prices were too high. The actions are expected to be bitter, lengthy and costly.

W. INDIES

HE Scheme

The new £250,000 hydro-electric scheme for St. Vincent Electricity Services, at Richmond, is well advanced and is now expected to be completed next month. Undertaken by the Colonial Development Corporation, the scheme will double the generating capacity of the island and will enable the company to meet the steadily rising demand for power for several years to come.

GUINEA

Bauxite Operations End

The bauxite operations by Aluminium Ltd. in the Republic of Guinea, West Africa, are to cease in the next few weeks. The company has been unable to solve the financial problems involved in the continuation of work there by its subsidiary, Bauxite du Midi, but submitted other proposals for a new approach to the project for consideration. The Government of Guinea has insisted that the company adhere to the original long-term convention, but as the latter is unable in the circumstances to complete the project by July, 1964, the Government have instructed it to cease operations there.

INDIA

More Plant for Delhi

A proposal to install a 15 MW thermal generating plant at the central power house at Rajghat to meet the present power shortage was approved by the Delhi Electric Supply Committee a few days ago. This plant will be in addition to the 30 MW plant under construction (which is expected to be commissioned in August, 1963) and the bulk supply to be obtained from the Bhakra-Nangal grid system from 1963. Orders for the new plant are expected to be placed this month. The committee also decided to purchase 31,000 house service meters during the current financial year.

AUSTRALIA

Takeover

The Hunter Valley County Council, New South Wales, is to take over the local electricity distribution systems from three collieries as from January next. This arrangement, reached after four years' negotiations, is costing the Council £470,000. The companies are: Caledonian Collieries, J. and A. Brown, Abermain Seaham Collieries and Hebburn Ltd.

NEW ZEALAND

Christchurch Results

With a 7·6% increase in units sold, the Christchurch (NZ) Municipal Electricity Department reports a net surplus of £68,187 for operations in the year ended 31 March last. Load factor, at 49·7%, is not likely to be maintained indefinitely, according to Mr G. H. Battersby, general manager, bearing in mind that peak benefit has been reached from the ripple control system. He states that the opinion frequently expressed, that high load factor is worth obtaining at any cost, cannot be substantiated. The undertaking has four ripple control ejection sets, the capital cost of which, plus the relays, interest and maintenance, was estimated to have been recovered by the reduction of power costs by last December. He estimates the savings for the current year at about £200,000. The showroom had another successful year in appliance sales, with a net profit of £7,020 from a turnover of £134,000.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

10 Nov.—Basildon U.D.C. Supply and erection of 178 Class "B" tungsten lamps on concrete columns. Applications to Engineer and Surveyor, 88 Town Sq, by above date.

10 Nov.—Bournemouth C.B.C. Supply of: (1) 20 slow signs complete with lighting unit; (2a) 100 lighting units for existing signs; (2b) switchgear boxes for existing signs.—See 2 Nov. issue.

10 Nov.—Down C.C. Electrical installation in Divisional Office and Clinic extension, Pound La, Downpatrick.—See 26 Oct. issue.

10 Nov.—Enerdale R.D.C. Supply and erection of 22 concrete columns with mercury lighting along A595.—See 2 Nov. issue.

10 Nov.—N.I. Housing Trust. Electrical installations in (a) 37 dwellings and one shop at Londonderry and (b) 89 dwellings at Newcastle.—See 2 Nov. issue.

11 Nov.—Batley B.C. Supply of: 21 reinforced concrete columns; sodium lanterns/lamps/gear; solar dial time switches for trunk road lighting.—See 2 Nov. issue.

11 Nov.—East Anglian Hospital Board. Applications invited for inclusion in select list for engineering services.—Advertised 2 Nov. issue.

12 Nov.—Sunderland C.B.C. £45,000 electrical installation in Technical College, South Johnson St.—Advertised 19 Oct. issue.

13 Nov.—Belfast. (a) Electrical installation in new pavilion, Deramore Park, for the Collegians Club. Details from consulting engineer: A. W. G. Holt, 7a South Parade, Belfast. Deposit £5 5s.

13 Nov.—Holywood U.D.C. Electrical installation in proposed sports pavilion, Seapark recreation grounds.—See 26 Oct. issue.

13 Nov.—Hornchurch U.D.C. (1) Supply of 275 g.p.m. sewage pumping plant, motors and gear for Parsonage Rd pumping station.—See 26 Oct. issue.

13 Nov.—Strabane R.D.C. Supply and installation of 60 g.p.m. at 25 ft head sewage pump.—See 26 Oct. issue.

13 Nov.—West Lothian C.C. (7) Electrical work in 30 houses in School Pl, Uphall redevelopment scheme. Applications to County Clerk: J. Calder, County Bldgs, Linlithgow, by above date.

14 Nov.—Dun Laoghaire B.C. Provision of public lighting along Bray Rd, Loughlinstown. Town Clerk, Town Hall. Deposit £5.

14 Nov.—Enniskillen. Electrical installation in new kitchen at R.U.C. Depot.—See 2 Nov. issue.

14 Nov.—Loughborough B.C. Provision and erection of 13 Group "A" steel columns with 400 W mercury lighting.—See 26 Oct. issue.

17 Nov.—Glasgow C.C. Supply of electrical materials for six months. Manager, Housing and Works Department, 266 George St.

17 Nov.—Maidstone B.C. Scheme 57A. Electrical installation in old people's hostel, Shepway estate. Borough Engineer, Palace Ave.

20 Nov.—Forth Rd Bridge J.B. Supply/installation/connecting up of 192 200 W and 140 W sodium lamps on 35 ft and 25 ft steel columns, together with special lighting and illuminated bollards for approach roads lighting.—See 2 Nov. issue.

20 Nov.—Ipswich C.B.C. Erection of 82 Group "A" steel and concrete columns and provision/erection of 140 W and 85 W sodium lanterns/lamps/gear. Borough Engineer and Surveyor, 19 Tower St. Deposit £1 1s.

20 Nov.—Manchester C.C. Contracts 326A, B and C. Communal TV distribution installations in 575 maisonnettes and flats, Miles Platting.—Advertised 2 Nov. issue.

20 Nov.—Tamworth B.C. Supply, erection and wiring complete of 200 W sodium lighting units: (1) ten on 30 ft steel columns; (2) two on 23 ft steel columns; (3) one on 28 ft 6 in. column; (4) two on existing columns. Borough Engineer and Surveyor: H. F. Bruce Smith, Municipal Offices.—Advertised in this issue.

20 Nov.—West Cumberland Water Board. 1,500 g.p.m. at 75 ft head pumps.—See 2 Nov. issue.

20 Nov.—West Riding C.C. Conversion of Thorne Swing Bridge on A614 to power operation.—See 2 Nov. issue.

21 Nov.—Ministry of Transport. Supply of steel lighting columns, traffic bollards and subway lighting and for cabling and installation work along Heads of the Valleys Rd (Section 1—Brynmawr to Abergavenny).—See 2 Nov. issue.

22 Nov.—Godstone R.D.C. Installation of two 5 in. dia. submersible pumps/10 h.p. motors and 200 yd asbestos-cement rising main.—See 2 Nov. issue.

23 Nov.—Down C.C. Electrical installation in Bangor Girls (new) Grammar School.—See 2 Nov. issue.

23 Nov.—Haughley P.C. Supply and erection of ten 25 ft concrete columns and 140 W sodium lighting. Council Clerk, Mere Farm, Haughley, Suffolk.

24 Nov.—Hereford C.C. Electrical installations in 74 houses No. 6 site and 72 houses No. 7 site, Newton Farm.—Advertised 26 Oct. issue.

24 Nov.—Longbenton U.D.C. Supply and erection of 164 concrete post-top lantern filament lighting units. Engineer and Surveyor: A. E. Sweetman, Council Offices, Forest Hall, Newcastle 12. Deposit £2 2s.

27 Nov.—Kirkcaldy B.C. Supply and installation of 400 cookers and 200 washboilers. Burgh Engineer, Town Hse.

27 Nov.—Linlithgow B.C. Erection of 37 Class "B" steel columns and supply/erection of lanterns/lamps/gear. Burgh Surveyor, Council Offices, High St.

27 Nov.—Worksop B.C. Scheme involving 217 60 W sodium lighting on 15 ft concrete columns: (1) Supply of lanterns/lamps/gear; (2) removal of existing lighting and supply of columns together with wiring and fitting of equipment; (3) whole of work.—Advertised 2 Nov. issue.

28 Nov.—Dartford B.C. 15 15 ft steel columns and mercury lamps/lanterns on Temple Hill (Site 2c).—See 2 Nov. issue.

28 Nov.—Dartford B.C. 26 25 ft reinforced concrete columns and 400 W MBF/U lamps/lanterns along Watling St.—See 2 Nov. issue.

30 Nov.—Cardiff C.C. Electrical installation, on fixed-price basis, in proposed Fairwater Primary School, Pentrebane Rd. Details from W. S. Atkins and Ptnrs., Arlbee Hse, Greyfriars Pl, Cardiff. Deposit £2 2s, made payable to Cardiff Corpn.

2 Dec.—Kilkenny C.C. One 1,000 g.p.h. submersible pump.—See 26 Oct. issue.

4 Dec.—Petersfield R.D.C. Supply and erection of Group "A" lighting: (1) 36 columns/one bracket with 140 W sodium lanterns/gear and wiring along London Rd, Liphook; (2) 36 columns with 140 W sodium lighting along London and Portsmouth roads, Horndean. Council Clerk: G. H. Walker, The Old College. Deposit £3 3s.

5 Dec.—Leeds C.C. Supply and erection of 30 g.p.m. at 165 ft head booster pumping plant, complete with switchgear, motors, time controls, etc., at Carlton Rise, Waterworks Dept., Civic Hall.

7 Dec.—Dundee Harbour Trust. Supply and erection of three level luffing travelling cranes of the portal type. General Manager and Engineer: A. Smith, Harbour Chmbrs, Dock St.

18 Dec.—E.B. for N.I. Specification 1642. Lighting and heating associated with No. 4 boiler and turbo-generator at Coolkeeragh.—See 2 Nov. issue.

18 Dec.—Southampton C.B.C. Electrical installation in College of Technology.—Advertised 2 Nov. issue.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 109 queries answered this week

"Aeroflex" fuses—makers of? M.A.N.W.E.B.—Parmiter, Hope and Sugden Ltd., Fluvent Electrical Wks, Longsight, Manchester 12.

"Patay" motors—suppliers of? T.E.—Babcock and Wilcox Ltd., 209 Euston Rd, N.W.1.

"Invisaflex" bracket fittings—address for? R.C.—Electricity Services Ltd., 6 Laurence Pountney Hill, E.C.4.

"Tempkon" condensing units—makers of? S.D.S.—Temperature Ltd., Burlington Wks, Burlington Rd, S.W.6.

"Durelect" baking oven—makers of? A.J.—Tom Chandley Ltd., 32 Moor St, Rusholme, Manchester 14.

"Maytag" commercial washing machines—suppliers of? J.L.—James Armstrong and Co. Ltd., 29 St. James's Pl, S.W.1.

"Braun" fan heaters—agents for? P.W.—Brattel Electric Co. Ltd., 1-9 Dover Yard, Berkeley St, W.1.

ANSWER WANTED

"Gayheat" infra-red heaters and "Duraheat" fan heaters—makers of? F.L.C.—

FURTHER ANSWER

All-insulated, moulded plastics, bulkhead fittings—makers of? E.E.B.—Metway Electrical Industries Ltd., Canning St, Brighton 7, Sussex.

. . . and Overseas

Details of items marked • may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.

17 Nov.—New Zealand. Paper and p.v.c. insulated cables (ten items). Dunedin City Corpn. Electricity Dept. B.o.T. (ESB/33461/61).•

17 Nov.—New Zealand. 50 distribution transformers 10 to 1,000 kVA (12 items). Town Clerk, P.O. Box 5045, Dunedin. B.o.T. (ESB/34088/61).•

17 Nov.—Rhodesia and Nyasaland. 500 gross 1½ V leakproof torch cells. Controller of Stores, P.O. Box 415, Lusaka. B.o.T. (ESB/32577/61).•

17 Nov.—Thailand. Wattmeters, voltmeters and ammeters. Provincial Electricity Authority, Sam-Sen, Bangkok. B.o.T. (ESB/34069/61).•

20 Nov.—Australia. 22 kV metal-clad switchgear. S.E.C. of Victoria, 22-32 William St, Melbourne C.1. B.o.T. (ESB/33142/61).*

20 Nov.—Australia. 72 66 kV condenser bushings. Secretary, S.E.C. of Victoria, 22-32 William St, Melbourne C.1. B.o.T. (ESB/34057/61).*

20 Nov.—Burma. Cable (three items). Director-General, Union of Burma Purchase Board, St. John's Rd, Rangoon. B.o.T. (ESB/34050/61).*

20 Nov.—Burma. Motors 5 to 100 h.p. (45 items); ironclad switch-fuses from 240 V 10 A to 400/440 V 250 A (11 items); 40 W fluorescent fittings and 80 W mercury fittings; 415 V switchboards. Director-General, Union of Burma Purchase Board, St. John's Rd, Rangoon. B.o.T. (ESB/34048-49-51 and 52/61).*

22 Nov.—Iraq. Two 250 W generating sets. Ministry of Defence, Directorate of Contracts and Purchases, Baghdad. B.o.T. (ESB/34021/61).*

22 Nov.—Kuwait. 18 battery trickle chargers for 80 x 1·2 V at 15 A. President, Department of Electricity Water and Gas, Kuwait. B.o.T. (ESB/34032/61).*

22 Nov.—Norway. N.A.T.O. Infrastructure Contract: 11 50 kVA to 250 kVA diesel-generators. Forsvarets Bygningstjeneste, Bygning 58, Festningen, Oslo. B.o.T. GD. 159/60 (38).*

23 Nov.—Burma. 150 60 in. ceiling fans; 1,000 pin type insulators. Director-General, Union of Burma Purchase Board, St. John's Rd, Rangoon. B.o.T. (ESB/33718 and 9/61).*

24 Nov.—S. Africa. 15 ton bare round stranded concentric-lay copper-clad steel-cored wire. Town Clerk, West St, Durban. B.o.T. (ESB/34338/61).*

25 Nov.—Iraq. "Electrical sets" for Abu-Saida and Al-Mansooriyah. Secretary, Purchases and Tenders Committee, Ministry of Municipalities. B.o.T. (ESB/34026/61).*

27 Nov.—Australia. Transmission line carrier coupling apparatus. Secretary, S.E.C. of Victoria, 22-32 William St, Melbourne C.1. B.o.T. (ESB/33141/61).*

28 Nov.—S.W. Africa. 1,000 air depolarised primary cells. Secretary, Tender Board, S.W.A. Administrations, P.O. Box 27, Windlock. B.o.T. (ESB/34098/61).*

1 Dec.—Rhodesia and Nyasaland. V.H.F./U.H.F. radio equipment for communication between Norton and Salisbury for Kariba H.E. Scheme. Applications to Secretary, Federal Power Board, P.O. Box 630, Salisbury, S. Rhodesia; and consulting engineers: Merz and McLellan, Carliol Hse, Newcastle 1, by above date.—Advertised in this issue.

1 Dec.—S. Africa. Signalling cable p.v.c. insulated and s.t.a. (13 items) for S. African Railways. Chairman of the Tender Board, S.A.R., P.O. Box 7784, Johannesburg. B.o.T. (ESB/34037/61).*

3 Dec.—Kuwait. 13 A plugs, adaptors, surface and flush sockets. Department of Electricity, Water and Gas. B.o.T. (ESB/34029/61).*

5 Dec.—Canada. 19 230 kV c.b's and central compressor plants for Grand Rapids and Brandon generating stations and for terminal stations, Ashern and Rosser. General Manager, Manitoba Hydro, P.O. Box 815, Winnipeg. B.o.T. (ESB/33756/61).*

12 Dec.—India. Flameproof d-o-l starters. Singareni Collieries Co. Ltd., Kothagudium Collieries P.O., Bhadrachellam Rd Station, Central Railway, Deccan. B.o.T. (ESB/33480/61).*

14 Dec.—India. Two 66 kV, 400 A isolators; one 66 kV, 400 A line oscillator with earthing switch; 500 MVA o.c.b. current transformers; surge diverters; control and relay board; insulators, busbar connections, terminals, etc. Chief Engineer (Construction), Projects Section, Puniab S.E.B., 9 Ram Bagh, Patiala. B.o.T. (ESB/33491/61).*

16 Dec.—Iraq. Insulators and accessories, switches and h.t. fuses. Stores of the Directorate General of Municipalities. B.o.T. (ESB/34025/61).*

19 Dec.—Pakistan. Seven 33 kV and 66 kV substations in Lahore-Kalabagh and Sargodha areas for W.A.P.D.A. R. E. B. Willcox and Co., 36 Gt. St. Helens, E.C.3, are representatives. B.o.T. (ESB/33777/61).*

28 Dec.—Hong Kong. Electrical plant including 6·6 kV switchboards, transformers, diesel alternators, distribution boards, air conditioning plant and lighting fittings for pumping stations and treatment works of Plover Cove and Hebe Haven Water Scheme. Details from Crown Agents, 4 Millbank, S.W.1; reference E.C.2, Hong Kong 4758. Deposit £10.—Advertised 2 Nov. issue.

15 Jan.—India. 10 MW alternatively 15 MW thermal plant complete for Beas Dam Project. Executive Engineer, Stores Division, Nangal Township. B.o.T. (ESB/33468/61).*

26 Jan.—Australia. Three boiler units and structural steelwork for West Moreton Power Station, Ipswich, which is to be known as the Swanbank Power Station. Queensland Southern Electric Authority. B.o.T. (ESB/33490/61).*

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Beckastat. 821,306. Class 9. Thermostatic control apparatus, etc. Kent and Wells Ltd., Harlequin Ave, Gt. West Rd, Brentford, Middx.

Bendix. B803,745. Class 9. Relays, switches, transformers, apparatus and instruments, etc. The Bendix Corpn., 401 Bendix Drive, South Bend, Indiana, U.S.A.

Elkomold and **Elkopack.** 817,737 and 8. Class 9. Capacitors. The Telegraph Condenser Co. Ltd., Wales Farm Rd, North Acton, W.3.

Insulok. 815,173. Class 17. Plastics cable clips, etc. Insuloid Manufacturing Co. Ltd., Sharston Wks, Leestone Rd, Wythenshawe, Manchester 22.

Jastac. 813,669. Class 9. Connections, contacts and inserts, etc. J. and S. Engineers Ltd., 1a London Rd, Crayford, Kent.

Klixon. B804,177. Class 9. Thermostats, thermostatic elements, switches, circuit-breakers, etc. Texas Instruments Inc., 13500 North Central Expressway, Dalas, Texas, U.S.A.

Multifix. B812,888. Class 9. Scientific and electrical apparatus and instruments, etc. Loughborough Glass Co. Ltd., 12 Derby Rd, Loughborough, Leics.

Servalco. 799,301. Class 7. Rotary electromechanical machines, etc. **Servalcosyn.** 799,303. Class 7. Synchro generators and motors, etc. Société D'Electronique et D'Automatisme, 31 rue de la Baume, Paris 8eme, France.

Spacemaker. 793,657. Class 9. Electrical and electronic apparatus, etc. Pilot Radio and Television Ltd., 31-37 Park Royal Rd, N.W.10.

Stockfield. B822,730. Class 11. Lighting fittings and installations, etc. Stockfield Manufacturing Co. Ltd., Morcom Rd, Birmingham 11.

Tag-o-lectric in design. 813,873. Class 7. Machines for marking garments and laundry, etc. Textile Marking Machine Co. Inc., 45 Oberdorfstrasse, Horgan, Canton Zürich, Switzerland.

Taywil Smithlite. 817,374. Class 11. Lighting and heating installations, etc. Herman Smith Ltd., Reliance Wks, King St Passage, Dudley, Worcs.

Triomatic. 817,108. Class 7. Washing machines. Bendix Home Appliances Ltd., Albion Wks, Kingsbury Rd, Birmingham 27.

CONTRACTS PLACED

Birmingham Hospital Board. Electrical services in: dental dept., C. R. Marson Ltd., £1,209, and admin. offices, H. Pratt Ltd., £1,808, at Coventry and Warwickshire Hospital; Ercall Ward rebuilding, Robert Jones and Agnes Hunt Orthopaedic Hospital, G. H. Smallwood and Co. Ltd., £4,221; Hailey Nurses' Home, W. H. Taylor (Wolverhampton) Ltd., £3,235; rehabilitation unit, Rubery Hill and Hollymoor Hospital, S. Davis (West Bromwich) Ltd., £24,872; Selly Oak Hospital, Electrical Installations Ltd., £19,219; Marston Green Maternity Hospital, S. Dagnall and Son Ltd., £1,639; Empire Hse, Birmingham, Etna Lighting and Heating, £1,523; Bridgnorth and South Shropshire Infirmary, J. T. Jarvis and Son Ltd., £1,152; Royal Hospital, Wolverhampton, C. A. and W. J. Postings, £17,831; Corbett Hospital, Stourbridge, C. A. and W. J. Postings, £18,970. Recommended.

Durham C.C. Supply and erection of 20 Group "A" steel columns complete with 400 W mercury lanterns/gear at new County Hall, Abacus Municipal Ltd.

Lytham St. Annes B.C. Supply and erection of nine concrete and 85 c.i. columns, resiting of 25 columns and renewal of 42 brackets, Revo Electric Co. Ltd.

Salford C.C. Electrical work in Frederick Rd Transport Depot modifications, Piggott and Whitfield, £32,178. Rewiring work at Langworthy estate, N.W.E.B., £8,600. Recommended.

Stoke Newington B.C. Provision of street lighting along Albion Rd and Stoke Newington Church St, G.E.C., £6,542. Recommended.

TRADE NOTES

Canadian Agents. Crompton Parkinson Electrical Ltd., of Brantford, Ontario, have taken over the sales of Aeroflex fuse-links designed to Canadian standards by Parmiter, Hope and Sugden Ltd.

Changes of address. Maynards (Electrical) Ltd. have this week moved to larger premises at 11 Devonshire Rd, W.4. The telephone No. remains Chiswick 5158.

The sales and administration departments of Polypenco Ltd. have moved to Gate Hse, Welwyn Garden City, Herts.

Ceylon imports. The British Trade Commissioner has reported that Ceylon will now issue quotas for electric irons at 50%; electric cooking and heating apparatus at 25%; and hair dryers and hair clippers at 50%.

Distributors. Hardman and Co., Baillie St, Rochdale, have been appointed North West England stockists and distributors of electrical components and relays made by the Special Products Division of Thorn Electrical Industries Ltd.

Morganite Electroheat Ltd., Point Pleasant, Wandsworth, S.W.18, have been appointed sole U.K. distributors for Norton Crystolon Hot Rods for furnaces.

London office. New accommodation to house the whole of the London staff of Ruston and Hornsby Ltd. group has been acquired in Berkeley Sq Hse, W.1.

New factory. Construction has started of the new 125,000 sq ft factory at Cheney Manor, Swindon, for Square D Ltd., which is scheduled for completion in mid-1962.

S.A. Duty. Representations have been made to the South African Board of Trade and Industries for an increase in duty on flashers, border chasers/scintillators and h.v. animators as used in neon and other electric sign industries, from 15% *ad valorem* to 25%.

BUSINESS PROSPECTS

Basingstoke. 85 houses, 12 maisonnettes, Roundmead estate, proposed by L. Weaver Ltd., 45 Ledgers Rd, Slough.

Blackpool. Major extensions, over ten-year period, Victoria Hospital, Whinney Heys, proposed by Fylde Hospital Management Committee; cost: £2 million.

Bolton. Proposed: three 17-storey blocks, flats, three- and six-storey blocks of shops with offices over, Moss Bank Rd/Blackburn Rd, for Actan Ltd.

Bournemouth. Park Investments Ltd., Park La, W.1, placed contract as follows: flats, Surrey Rd; contractors: J. Drewitt and Sons Ltd., Ringwood Rd, West Howe, £148,000; flats, Chien Crescent Rd, G. T. Crouch Ltd., 7 Castleton Rd, Eastcote, Ruislip, £80,000.

Bradford. C.C. accept £284,745 tender from Pickles Bros. (Bldrs) Ltd., Halifax, for extensions, Margaret McMillan Memorial Training College.

Brighton. Planned: 88 flats in four-storey blocks, Leahurst site, London Rd, for Prowting Estates Ltd., High St, Ruislip.

Burnley. Wm. Leech (Builders) Ltd., St. James's St, Newcastle, propose residential development rear of Manchester Rd/Cog La.

Chapel-en-le-Frith R.D.C. Tender: 57 dwellings, various sites; Homeville and Co. Ltd., 12 Crauford Rise, Maidenhead.

Chatham. Planned: hotel and flats for Abbey Homesteads Ltd.; architects: Vincent Burr and Ptnrs., 85 Gower St, W.C.1.

Chester-le-Street. Derek Crouch Ltd., of Station Rd, Birtley, propose housing estate, Prebends Row, West Pelton. A. McCullough Ltd., 46 High St West, Gateshead, propose 172 houses, Garden Hse Farm.

Colwyn Bay. Development of new estate, 71¼ acres, Upper Colwyn Bay, planned by Henry Boot (Liverpool) Ltd., Aintree Rd, Bootle; plans provide for 338 dwellings, five shops.

Coventry. Proposed by Townsend Ferries Shipping Ltd., Warwick Rd, 3¼ acres, Kenilworth Rd, for residential development.

Croydon. Proposed: 61 houses, Waldronhyrst Hotel site and Bramley Hill, for Lawdon (Builders) Ltd., 157 Victoria St, S.W.1; 70 flats for Dorrington Investment Trust Ltd., 8 Hallam St, W.1. Factory/offices, Beddington La, proposed for J. Richards and Sons Ltd.; architects: Norman and Dawbarn, 7 Portland Pl, W.1. Proposed by Governors of St. Andrew's Secondary School, new school for 300 pupils at cost of £145,700. National Spastics Soc., 9 Park Cres, W.1, plan Coombe Farm N.S.S. centre, Oaks Rd, Shirley.

Dalbeattie B.C. Tender: 24 dwellings, Port St and Glenshalloch; Clerk.

Daventry. Chowns Ltd., 63 Edinburgh Rd, Northampton, plan 230 dwellings nr. Inlands.

Denton U.D.C. Tender: 66 dwellings, Dark La Farm; Engineer.

Devizes. Orchard and Peer Ltd., 32 Liverpool Rd, S.W.19, propose 125 houses, Roundhay Park. T. G. Coleman proposes 150 houses, same estate. Lady Anne Cowdray, Broadleas, Devizes, proposes 30 houses, Broadleas.

Doncaster. Proposed: 45 houses, Burnett's Field, Urban Rd, Hexthorpe, for J. Dixon (Doncaster) Ltd.

Dover. Factory planned for B. M. Gheysens Ltd.; architects: L. R. Barlow, 32 Millwall Pl, Sandwich.

Dowlais. £120,000 contract placed for factory for O.P. Chocolate Specialists (Mfrs.) Ltd., Merthyr Tydfil; contractors: E. Taylor and Co. Ltd., Treforest Industrial Estate, Pontypridd.

Durham. Planned by R. E. Coleman Ltd., High St, Carrville, 38 houses, The Sands.

Edinburgh. Proposed: 600 houses, Southhouse, for J. Miller and Ptnrs. Ltd., 18 George St, Edinburgh 2.

Essex. Proposed by Denbrick Investments Ltd. 25-storey point block of 75 flats and 100 underground garages, Hall La, Walton-on-the-Naze.

Folkestone. Planned: 30 houses, Castle Bay, Sandgate, for John Mowlem and Co. Ltd., 91 Ebury Bridge Rd, S.W.1.

Gateshead. Three-storey shopping development, High St, proposed by Matmers Properties Ltd., York Pl, Leeds.

Glasgow. C.C. propose High School for Girls, Cleveden Rd. Tender: 169 houses, Pollokshaws redevelopment; Architectural and Planning Dept.

Grangemouth. B.C. propose 111 houses, Airfield seventh development; Architect.

Grantham. Proposed: shops/showrooms/stores/staff rooms/offices, Watergate/Vine St, for City and Town Buildings Ltd.; architects: L. H. Fewster and Ptnrs., 22 Conduit St, W.1.

Grimsby. T.C. propose £300,000 library, Town Hall Sq; Borough Engineer.

Guildford. 46 houses, South La, Ash, proposed by Henry T. Hill and Son, Connaught Bldgs, Brookwood.

Hastings. Proposed: 40 bungalows, stage IV, of Alexandra Pk estate, for Millview Estates Ltd. 72 bungalows, 35 houses, Old Rd Farm, St. Helens Rd, for Bushmark Developments Ltd.; plans by A. C. Draycott, South St, Lancing. Proposed: £163,000 abattoir to serve Hastings, Battle Rye, and Bexhill authorities.

Henley. 49 houses, Hunters Ride, proposed by John McLean and Sons Ltd.

Hereford. 66 dwellings proposed, Queen's Paddock, for Bryant Homes Ltd., Whitmore Rd, Birmingham 10; plans by W. Ebery and Ptnrs., 24 Wordsworth Rd, Birmingham 10.

Heywood. Proposed by James Berry and Son Ltd.: heliport, motel, restaurant, etc., off Bury New Rd; architect: J. S. Barnes, 44 Chadwick La.

Kettering. Wilsons (Bldrs.) Ltd., Northampton, propose 59 dwellings, Grosvenor Rd.

Kingsclere. Lock Construction Co. Ltd. propose 76 houses on land adjointing Elm Grove.

London. Proposed: shops, showrooms and flats, Baker St, Portman Sq, W.1; applicants: J. Stanley Beard, Bennett, Wilkins and Ptnrs., 101 Baker St, W.1. Proposed: 54 luxury flats, grounds of Hendon Hall Hotel, Gt. North Way; cost: £280,000; architects: H. Owen Luder, 79 Regency St, S.W.1. Proposed: factory buildings, Manor Rd, Stoke Newington, N.16, for D. Politi and Sons Ltd., Manor Rd. Post Office Engineering Depot proposed. Hanger La, W.5; plans by M.o.W. Architects' Dept., Abell Hse, John Islip St, S.W.1. Planned by R. Seifert and Ptnrs., architects, 34 Red Lion Sq, W.C.1, office block on site, Gt. Dover St, Long La, Tabard St, S.E.1. Proposed: shops/offices, site of Century Cinema, New Cross Rd, Deptford; architect: H. Owen Luder, 79 Regency St, S.W.1. Gollins, Melvyn Ward and Ptnrs., architects, 15 Manchester Sq, W.1, propose comprehensive development covering 13 acres, Hammersmith Broadway, W. City Parochial Foundation plan 12-storey block of flats with shops, garages, petrol station, Queensway, W.2. Proposed: multi-storey mechanical car park, Savile Row, Old Burlington St; applicants: Howard V. Lobb and Ptnrs., architects, London. C.C. accepted £172,515 tender from Allen Fairhead and Sons Ltd., Sydney Rd, Enfield, for old people's home in grounds of Ladywell Lodge, Lewisham, S.E.

Luton. Planned: 54 dwellings, Icknield Nurseries, for Pearce and Barker Ltd., 71 Leagrave Rd.

Maidstone. 100 flats and maisonnettes, Tonbridge Rd, for Cuckmere Brick Co. Ltd., Berwick Station, Alfriston, Polegate.

Manchester. Contract placed for factory, offices, Medlock St, for Gland Supplies Ltd.; contractors: P. Hamer Ltd., Swinton.

Mansfield. Proposed: 42 houses and bungalows, Bramble La, for Geo. Wimpey and Co. Ltd., Hammersmith Gro, W.6.

Melton Mowbray. U.D.C. propose £80,000 improvements, Cattle Market; Surveyor.

Middlesbrough. Proposed: factory and showroom, Cumberland Rd, for Trodahl Ltd.; architects: Crawford and Spencer, 91 Borough Rd.

Midlothian C.C. Tender: 156 dwellings, Newbattle New Community; County Architect, Palmerston Pl, Edinburgh.

Newbury. Oxford Regional Hospital Board, Banbury Rd, Oxford, propose general hospital with 250 beds on 12-acre site, Goldwell Park.

Newcastle. Proposed: 300 flats, Jesmond Dene; promoters: John T. Bell and Sons, Market Chmbrs, Market St; cost: £1 million. W. Leech Ltd., St. James St, plan £250,000 blocks of flats, Benwell. Wimpey and Co. Ltd., Orchard Hse, Fenwick Terr, propose multi-storey building, Oakwood, nr. Westgate Rd. Percy St Investments Ltd. propose £250,000 eight-storey block, with shops/offices; architects: L. J. Couves and Ptnrs., Grainger Chmbrs, Hood St.

New Malden. Shopping block and offices planned, High St; quantity surveyors: C. T. Kelly and Ptnrs., 8 Manchester Sq, W.1.

Newport (Mon). B.C. accepted £80,026 tender of N. T. James Ltd., Kelvedon St, for old people's home, Gaer Rd.

Norfolk. Proposed by K. S. Jewson, Beetley Common, Norfolk, eight acres, Beetley, for residential development.

Northants. C.C. propose £93,360 extensions and alterations to Moulton Institute of Agriculture; County Architect, Northampton.

Northumberland. C.C. propose girls' grammar school, Alnwick.

Oswaldtwistle. 150 dwellings, Aspen La and Thwaites Rd, proposed for Davies Bros., Morecambe, Lancs.

Oxford. Robert Matthew, Johnson-Marshall and Ptnrs., Ferguson Hse, Marylebone Rd, N.W.1, architects for three new boarding houses, Woodstock Rd, for St. Edwards School.

Penrith. 95 dwellings, Wetheriggs estates, planned by Border Engineering Contractors Ltd., 125 Queen St, Whitehaven.

Runcorn. 113 houses and bungalows are planned, Clifton Rd, by Cholmondeley Developments (1961) Ltd.

Sale. Beaumont Property Trust Ltd., London, plans hotel, shops, 16-storey flats and three elevated car parks, Springfield Rd area.

Sedgefield. Bainbridge and Son, 44 High Row, Darlington, propose 150 houses, Spring La.

South Shields. B.C. placed contract for 129 houses, Simonside, with Whittal Ltd., West Boldon.

Sunderland. B.C. propose 896 dwellings, Town End Farm estate, and 156 maisonnettes, Parade area; Borough Architect, Stockton Rd. C.B.C. Tender: 176 dwellings; Borough Architect.

Torquay. Proposed: three blocks of flats in 11-, eight- and three-storey construction, St. Luke's Rd South, for Bernard Sunley and Sons Ltd., 25 Berkeley Sq, W.1.

Upholland. 81 dwellings, Chequer La, proposed for A. and J. Mucklow and Co. Ltd., Ettingshall Hall Farm, Sedgley, Wolverhampton.

Wakefield. Planned: 81 houses, Thornes Moor Rd, for Lawefield Estates Ltd., Lawefield La.

Wallsend. Proposed: factory block, Neptune Rd, for Thermal Syndicate Co. Ltd.; architects: L. J. Couves and Ptnrs., Grainger Chmbrs, Hood St, Newcastle.

Washington. Laboratory and offices, Station Rd, planned for Powell Duffryn Ltd., Proctor Hse, The Side, Newcastle.

West Bromwich. 360 houses planned by Jones, Mackay and Croxford, agents, 79 Edmund St, Birmingham 3.

West Hartlepool. Crawford and Spencer, 91 Brough Rd, Middlesbrough, architects for proposed St. Anne's R.C. Secondary Modern School.

Woodley. Geo. Wimpey and Co. Ltd., Hammersmith Gro, W.6, propose to develop 7½ acres of Foster La estate.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Walter Instruments Ltd. Mr C. E. M. Emmerson, 28 King St, E.C.2, and Mr H. W. Pitt, 100 Park St, W.1, appointed joint liquidators at extraordinary general meeting on 24 Oct. for the purpose of voluntarily winding-up.

Home Electrical Products Ltd. and **Home Electrical Products (Northern) Ltd.** Meeting of creditors to be held at 14 Manor Rd, Coventry, on 13 Nov., at 11.30 a.m.

Davis Bros. (Electrical) Ltd. First meetings of creditors and contributories to be held at Room 401, Inveresk Hse, 346 Strand, W.C.2, on 10 Nov., at 2.30 and 3 p.m.

Allray Electrical and Eng. Co. Ltd. First meetings of creditors and contributories to be held at Official Receiver's Office, County Court Bldgs, Westgate St, Cardiff, on 17 Nov., at 11 and 11.30 a.m., respectively.

Valley Electries Ltd. Last day for receiving proofs for intended dividend: 14 Nov., by liquidator: N. Saddler, Pearl Chmbrs, East Parade, Leeds 1.

A. Bastin and Co. (Electrical) Ltd. Liquidator: A. Cheek, 346 Strand, W.C.2, released as from 9 Oct.

G. Cousins Ltd. Liquidator: A. W. Hunter, Walter Hse, 418-422 Strand, W.C.2, released as from 31 July.

Shadbolt Bros. Ltd. Liquidator: R. A. Rodgers, 25 Bedford Row, W.C.1, released as from 18 Sept.

Reelek Appliances Ltd. Winding-up order dated 23 Oct.

Allray Electrical and Eng. Co. Ltd. Winding-up order dated 19 Oct.

Lee Guinness Ltd. Petition for winding-up to be heard before the High Court of Justice, Strand, W.C.2, on 13 Nov. Persons intending to appear to notify Linklaters and Paines, Barrington Hse, 59-67 Gresham St, E.C.2, by 4 p.m. 10 Nov.

Snelsons Electrical (M/cr) Ltd. Petition for winding-up to be heard before the High Court of Justice, Strand, W.C.2, on 13 Nov. Persons intending to appear to notify Cochrane and Cripwell, 119 Finsbury Pavement, E.C.2, by 4 p.m. 10 Nov.

Valcon Electrical Ltd. Petition for winding-up to be heard before the High Court of Justice, Strand, W.C.2, on 13 Nov. Persons intending to appear to notify G. Warr and Co., 1 New Sq, Lincoln's Inn, W.C.2, by 4 p.m. 10 Nov.

Leonards Radio and Electrical Ltd. First meetings of creditors and contributories to be held at Room 401, Inveresk Hse, 346 Strand, W.C.2, on 15 Nov. at 2.30 and 3 p.m. respectively.

BANKRUPTCY ACTS

Receiving Order

Southend. D. Hill, electrical engineer, formerly carrying on business as Brentwood Electronics at Ongar Rd and 10 Cromwell Rd, Brentwood. Receiving order dated 24 Oct.

First Meeting and Public Examination

Kingston upon Thames. R. Martin and Co., radio, television and electrical dealers, formerly carrying on business at 62 The Green, Twickenham. First meeting: 11.30 a.m., 24 Nov., at City Gate Hse, 39-45 Finsbury Sq, E.C.2; and public examination: 11 a.m., 12 Dec., at County Court, St. James Rd, Kingston upon Thames.

Application for Discharge

Macclesfield. C. T. Powell, electrical engineer, formerly carrying on business as George Cooke and Co. at Station Rd, Wilmslow. Order made on 5 Oct. on application for discharge: discharged as from 5 Oct., 1962.

Appointment of Trustees

Bradford. E. M. Perrett, furniture and electrical retailer, formerly carrying on business at 8 West La, Thornton. Mr G. E. Rushton, 36 North Parade, Bradford 1, appointed trustee as from 24 Oct.

Brighton. M. J. D. Jones, appliance dealer, formerly carrying on business at 14 Blackstock Rd, N.4. Mr J. S. Bradley-Hole, 8 Old Steine, Brighton 1, appointed trustee as from 24 Oct.

Intended Dividends

Carmarthen. J. E. Stephens, electrical engineer, formerly carrying on business at 10 Barn Rd, Carmarthen. Last day for receiving proofs for intended dividend: 15 Nov., by trustee: H. Lord, 2 St. Mary St, Cardigan.

Bristol. R. A. Gibson and P. L. Long, electrical and plumbing engineers, carrying on business in partnership at 9 Beech Rd, Horfield. Last day for receiving proofs for intended dividend: 15 Nov., by trustee: G. C. Ehlers, 28 Baldwin St, Bristol 1.

Hanley and Stoke-on-Trent. E. C. Johnson and J. A. Sheward, electrical contractors, formerly carrying on business as Edstan Electric at 40 Market St, Hanley, and 40 London Rd, Newcastle under Lyme. Last day for receiving proofs for intended dividend: 14 Nov., by trustee: W. H. Meredith, 12 Lonsdale St, Stoke-on-Trent.

Dividends

High Court of Justice. P. H. Mathews, manufacturer of ironware and electrical fittings, carrying on business at 32 Parkfield St, N.1. Dividend per £: 18s 9¼d, payable at Bankruptcy Bldgs, Carey St, W.C.2, on 10 Nov.

Bolton. N. Pilling, electrical contractor, formerly carrying on business at 48 Bury Rd. Dividend per £: 4¼d, payable at Official Receiver's Office, 20 Byrom St, Manchester 3, on 14 Nov.

MEETINGS TO NOTE

THURSDAY, 9 NOV.

I.E.E. (N. Scotland). "Thermistors—Their Theory, Manufacture and Application," R. W. A. Scarr and R. A. Setterington. Electrical Engineering Dept., Queen's College, Dundee. 7 p.m.

I.E.E. (S.W. Sub-Centre). Third Hunter Memorial Lecture: "The Application of Electronics to the Electricity Supply Industry," J. S. Forrest. Lecture Theatre, S.W.E.B., Electric Hse, The Parade, Taunton. 3 p.m.

I.E.E. (W. Wales). "A Survey of Street Lighting and Its Future," W. R. Stevens and H. M. Ferguson. Electricity Board Showrooms, The Kingsway, Swansea. 6 p.m.

INSTITUTION OF MECHANICAL ENGINEERS (Automatic Control Group). Brains Trust on Automatic Control. 1 Birdcage Walk, Westminster, S.W.1. 6 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Tees-side). Symposium on Modern Instrument Maintenance. Cleveland Scientific and Technical Institution, Middlesbrough. 7.30 p.m.

I.E.S. (Manchester Centre). "Lighting for Christmas," E. P. Lee. Demonstration Theatre, N.W.E.B., Town Hall Extension, Manchester 2. 6 p.m.

RADAR AND ELECTRONICS ASSOCIATION. "Space Communications," Part II: Orbits and Their Economics," W. F. Hilton. Lecture Hall, R.S.A., John Adam St, Adelphi, W.C.2. 7 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (Scottish). "Ultra High Speed Photography," W. A. Jones. Institute of Engineers and Shipbuilders, 39 Elmbank Crescent, Glasgow. 7 p.m.

R.S.A. "New Developments in the use of Solar Energy," H. Heywood. John Adam St, W.C.2. 5.15 p.m.

INSTITUTION OF PLANT ENGINEERS (Glasgow). "Industrial Air Conditioning," V. C. Taylor. Scottish Bldg Centre, 425 Sauchiehall St. 7.15 p.m.

R.S.A. (Commonwealth). "New Developments in the Use of Solar Energy," H. Heywood. John Adam St, Adelphi, W.C.2. 5.15 p.m.

A.S.E.E. (Bradford and District). "The British Standard Motor," J. L. Browell. Midland Hotel, Bradford. 7.30 p.m.

A.S.E.E. (Southampton). "Electricity in Agriculture," D. W. Holley. Cathedral Hotel, Salisbury. 8 p.m.

FRIDAY, 10 NOV.

I.E.E. (N. Scotland). "Thermistors—Their Theory, Manufacture and Application," R. W. A. Scarr and R. A. Setterington. Robert Gordon's Technical College, Aberdeen. 7.30 p.m.

I.E.E. (Tees-side). Annual dinner and reunion. Zetland Hotel, Saltburn. 7.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Midlands). "The Mathematics of Process Control," P. G. Farley. Lecture Theatre, Byng Kendrick Suite, Gosta Green College of Technology, Aston St, Birmingham. 7 p.m.

E.P.E.A. (Meter Engineers' Technical Group). "Demand Metering," W. Casson. Caxton Hall, Westminster, S.W.1. 6.30 p.m.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (Non-Destructive Testing Group). Discussion: The Role Played by Dislocation in Determining Mechanical Properties of Materials. 47 Belgrave Sq, S.W.1. 2.15 p.m.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (S. Wales). "Colour Television: Principles and Practice," K. Hacking. College of Technology, Newport. 6 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (Southern). "Recent Advances in Low Noise Microwaves Valves," Dr D. G. Kiely. Portsmouth College of Technology. 7 p.m.

ELECTRICAL INDUSTRIES BALL at Grosvenor Hse, Park Lane. 7.30 p.m.

SATURDAY, 11 NOV.

A.S.E.E. (S. Essex). Annual dinner and dance. Horseshoe Hotel, Tottenham Court Rd, W. 6 p.m.

MONDAY, 13 NOV.

I.E.E. (Mersey and N. Wales). "Some Notes on the Electrical Requirements of General Cargo Docks," E. R. Radway. Royal Institution, Liverpool. 6.30 p.m.

I.E.E. (N.E.). "Analysis of Overall Stability of Multi-machine Power Systems," J. G. Miles; and "Electronic Analogue Computer Simulation of Multi-machine Power System Networks," A. S. Aldred. Neville Hall, Westgate Rd, Newcastle upon Tyne. 6.15 p.m.

I.E.E. (N. Staffs). "Data Transmission," R. H. Franklin and J. Rhodes. Duncan Hall, Stone, Staffs. 7 p.m.

I.E.E. (S. Midlands). "Lighting for Monochrome TV Productions," P. Catlett; and "Colour TV Production Problems," I. Atkins. Winter Gardens, Malvern. 7.30 p.m.

I.E.E. (Western). "Technical and Economic Aspects of the Supply of Reactive Power in England and Wales," W. Casson and H. J. Sheppard. University Engineering Laboratories, Bristol. 6 p.m.

I.E.E. (London Graduates and Students). "The Work of the B.B.C. with Particular Reference to Transmitters," R. W. Leslie. Savoy Pl, W.C.2. 6.45 p.m.

I.E.E. (S. Midlands Supply and Utilisation Group). "Electricity in the Manufacture of Hydrogen-peroxide," B. E. A. Vigers and R. O. Fletcher. College of Advanced Technology, Gosta Green, Birmingham. 6 p.m.

I.E.E. (Scottish Electronics and Measurement Group). "Numerical Control of Machine Tools," D. F. Walker. Royal College of Science and Technology, Glasgow. 6 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Manchester). Joint meeting with Institute of Physics and the Physical Society. "The Role of the Physicist in Plant Instrumentation," Dr L. J. R. Postle. Manchester University.

I.E.S. (Sheffield Centre). "The New I.E.S. Code," H. E. Bellchambers. Grand Hotel, Sheffield. 6.30 p.m.

I.E.S. (Stoke-on-Trent). "Lighting Journey Down the Rhine," E. J. Smith. North Stafford Hotel, Stoke-on-Trent. 6.30 p.m.

ENGINEERING MATERIALS AND DESIGN EXHIBITION at Earls Court until 18 Nov.

FACTORY EQUIPMENT EXHIBITION at Earls Court until 18 Nov.

NATIONAL MAINTENANCE CONFERENCE AND EXHIBITION at Central Hall, Westminster, until 16 Nov.

A.S.E.E. (Bournemouth and District). "Electrics in Aircraft," R. Renshawe. The South Western Hotel, Holdenhurst Rd. 8 p.m.

A.S.E.E. (N.W. London). "Relays and Control Circuits," Dr W. L. Stern. Century Hotel, Wembley. 8.15 p.m.

TUESDAY, 14 NOV.

I.E.E. (Measurement and Control). "Tracking in Insulation," N. Parkman. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (N. Midlands). Discussion: "The Integration of Industrial and Academic Training." College of Technology, Calverley St, Leeds. 6.30 p.m.

I.E.E. (N. Ireland). "The Potentialities of Artificial Earth Satellites for Radiocommunication," W. J. Bray. Lecture Theatre LG25, David Keir Bldg, Queen's University, Stranmills Rd, Belfast 9. 6.30 p.m.

I.E.E. (Southern Electronics and Control Group). "High-speed Ferrite Core Stores," P. Cooke. University, Southampton. 6 p.m.

Meetings to Note—continued

I.E.E. (N.W.). "Progress in Oil-filled Cables and Their Accessories," A. N. Arnan, F. J. Miranda and G. R. Bishop; and "The Influence of Ageing on the Characteristics of Oil-filled Cable Dielectric," P. Gazzana Priaroggia and U. A. Pelagatti. Engineers' Club, Albert Sq, Manchester 2. 6.15 p.m.

I.E.E. (Scottish Electronics and Measurement Group). "Numerical Control of Machine Tools," D. F. Walker. Carlton Hotel, Edinburgh. 7 p.m.

I.E.S. "Changes in the Dimensions of Incandescent Lamps," A. G. Penny; "A Standard Heat Test Lamp for the Temperature Testing of Lighting Fittings," J. N. Bowtell and J. R. Coaton; "Temperatures in Lighting Equipment With Incandescent Lamps," J. Keen and H. F. Stephenson. Federation of British Industries, Tothill St, S.W.1. 5.30 p.m.

I.E.S. (Glasgow Centre). Joint meeting with A.M.E.M.I. "The Mining Engineer Looks at Lighting," J. Rae. Institution of Engineers and Shipbuilders in Scotland, 39 Elmbank St. 6.30 p.m.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (Electronics Group). "Electron Beam Parametric Amplifiers," 47 Belgrave Sq, S.W.1. 5.30 p.m.

A.S.E.E. "The Contribution of Nuclear Reactors to Engineering Progress," K. J. Wootton. Magnet Hse, Kingsway, W.C.2. 6.15 p.m.

A.S.E.E. (Aldershot and Districts). "Instrumentation." Queen's Hotel, Farnborough. 8 p.m.

A.S.E.E. (Bristol and West Graduates). "Special Pyrotenax Cables," R. W. Sutherland. Grand Hotel, Bristol. 8 p.m.

A.S.E.E. (Chester and District). "Some Aspects of Electricity Distribution in Rural Areas," H. V. Hayes. The Blossoms Hotel. 7.45 p.m.

A.S.E.E. (E. Kent). "Some Aspects of Consulting Engineering," A. Ellis. Clarendon Hotel, Broadstairs. 8 p.m.

A.S.E.E. (Glasgow). "Electrical Maintenance." Kenilworth Hotel, 5 Queen St. 8 p.m.

A.S.E.E. (Leicester). "Electro-magnetic Techniques in Flaw Detection," L. H. Mansell. Westcotes Constitutional Club, 124 Wilberforce Rd. 7.30 p.m.

A.S.E.E. (Oxford and Districts). "The Uses and Installation of Mineral Insulated Covered Cables." Board Room, Employment Exchange, St. Aldates. 7.30 p.m.

A.S.E.E. (York). "Pumps and Pumping," J. H. Trougher. Royal Station Hotel.

INSTITUTION OF HEATING AND VENTILATING ENGINEERS. "Structural Insulation of Buildings," J. Lawrie. Engineering Centre, Stephenson Pl, Birmingham 6.30 p.m.

INSTITUTE OF PLASTICS (Scottish). "Ageing and Weathering of Rubber and Some Plastics," W. McG. Morgan. Joint meeting with the I.R.I. Scottish Section. North British Hotel, Edinburgh.

WEDNESDAY, 15 NOV.

I.E.E. (E. Anglian). Third Hunter Memorial Lecture: "The Application of Electronics to the Electricity Supply Industry." J. S. Forrest. Electric Hse, Ipswich. 6.30 p.m.

I.E.E. (E. Midlands). Annual dinner. Victoria Station Hotel, Nottingham. 7.30 p.m.

I.E.E. (Rugby). Annual dinner. Masonic Hall, Rugby. 7.30 p.m.

I.E.E. (Southern). "A General Theory of Depreciation of Engineering Plant," D. Rudd. C.E.G.B. Offices, High St, Portsmouth. 6.30 p.m.

I.E.E. (Sheffield). "The Engineering Aspects of Plasma Physics," D. L. Smart, Grand Hotel, Sheffield. 6.30 p.m.

INSTITUTION OF MECHANICAL ENGINEERS (Nuclear Energy Group). Discussion: "The Influence of Gas-inlet Temperature on Magnox Reactors." 1 Birdcage Walk, Westminster, S.W.1. 6 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Bristol). "Instrumentation at Low Temperatures," Dr R. G. Chambers. Dept. of Physics, University of Bristol, The Royal Fort. 7.30 p.m.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (Midland). "Problems of Information and Control in Relation to Eye-movements," Prof. R. W. Ditchburn. University, Birmingham. 6.30 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (Radar Group). "Infra-Red Application in Navigation," C. M. Cade. London School of Hygiene and Tropical Medicine, Keppel St, W.C.1. 6 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (Merseyside). "The Guidance of Bats and Men by Echo-Location." L. Kay. The Walker Art Gallery, Liverpool. 7.30 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (S. Western). "Introduction to Analogue Computers," H. Davies. Bristol College of Science and Technology, Ashley Downe, Bristol, 7. 7 p.m.

INSTITUTION OF PLANT ENGINEERS (Kent). "Hydraulic Control Systems," J. C. Wells. Railway Hotel, Dartford. 7 p.m.

INSTITUTION OF ELECTRONICS (Reading). "Instrumentation Magnetic Tape Recording," T. D. Dalzell; and "Digital Magnetic Recording Techniques," G. C. Ziman. Sir Hermann Gollancz Hall, Clifton St. 7 p.m.

BUILDING EXHIBITION at Olympia until 29 Nov.

A.S.E.E. (E. Anglia). "Electric Motor Control Gear," R. F. Mathieson. Red Lion Hotel, Thetford. 7.30 p.m.

A.S.E.E. (Portsmouth and District). "Pyrometry: The Technique of Temperature Measurement." R.A.F.A. Club, Cosham. 7.30 p.m.

A.S.E.E. (Wolverhampton). "Transportation of Heavy Loads," S. Bowskill. Chamber of Commerce, District Bank Chmbrs, Lichfield St. 7.45 p.m.

INSTITUTION OF PRODUCTION ENGINEERS (Midlands). "Some Aspects of the Design of Machine Tools and Automation Equipment for the Future," F. A. Lewis. James Watt Memorial Institute, Birmingham. 7 p.m.

THURSDAY, 16 NOV.

I.E.E. (Utilisation). "The Design and Performance of High- and Low-voltage Terminal Boxes," K. K. Schwarz. Savoy Pl, W.C.2. 5.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Data Processing Section). "Digital Techniques for the Study of Sea Waves, Ship Motion and Similar Processes," D. E. Cartwright, M. J. Tucker and Miss D. B. Catton. Manson Hse, 26 Portland Pl, W.1. 6.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (East Midlands). "A Survey of the International Temperature Scale," J. A. Hall. The College of Further Education, Greenclose La, Loughborough. 7.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Grangemouth). "Development of a Precision Pressure Generator for Multiple Instrument Calibration," B. E. Adams. Leapark Hotel, Bo'ness Rd. 7 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Newcastle). "Data Handling and Processing," R. J. McQuaker. Conference Room, Roadway Hse, Oxford St. 7 p.m.

INSTITUTION OF PLANT ENGINEERS (Blackburn). "The Free Piston Engine," W. Lowe. Castle Hotel. 7.30 p.m.

CHELMSFORD ENGINEERING SOCIETY. "Development of Eurovision," M. J. L. Pulling. Social Hall, Hoffmann's. 7.30 p.m.

INSTITUTION OF ELECTRONICS (London). "Developments in Tunnel Diode Technology," I. Aleksander and M. R. McCann. London School of Hygiene and Tropical Medicine, Keppel St, W.C.1. 7 p.m.

INSTITUTION OF PRODUCTION ENGINEERS (N. Midlands). "The Russian Approach to Production," M. Seaman. Grand Hotel, Leicester. 7.15 p.m.

FRIDAY, 17 NOV.

I.E.E. (N.E. Graduates and Students). "The Transient Performance of the Synchronous Generator," M. W. Kennedy. Grey Hall, King's College, Newcastle upon Tyne. 6.30 p.m.

I.E.E. (N. Midlands). Annual dinner at Queen's Hotel, Leeds. 7 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Scottish). "Development of a Precision Pressure Generator for Multiple Instrument Calibration," B. E. Adams. Scottish Building Centre, Sauchiehall St, Glasgow. 7.15 p.m.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (X-Ray Analysis Group). "Imperfections in Crystals." Institution of Mechanical Engineers, Birdcage Walk, S.W.1; and 18 Nov.

MONDAY, 20 NOV.

I.E.E. Discussion: "Electrical Accidents and Their Causes—Including the Legal Aspects." Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (E. Midlands Electronics and Control Group). "Some Recent Advances in Semiconductor Circuits," G. B. B. Chaplin. Joint meeting with the Bedfordshire Sub-Centre. Swan Hotel, Bedford. 7 p.m.

I.E.E. (Mersey and N. Wales). "Transistors," P. Godfrey. Town Hall, Chester. 6.30 p.m.

I.E.E. (N.E. Measurement and Electronics Group). "Simulation of Intelligence," Prof D. M. Mackay. Rutherford College of Technology, Northumberland Rd, Newcastle upon Tyne. 6.15 p.m.

I.E.E. (Western Supply Group). "The Manufacture, Properties and Use of Some of the New Insulation Materials for the Electrical Industry," K. Pollard. Demonstration Theatre, Electricity Hse, Colston Ave, Bristol. 5.15 p.m.

I.E.E. (London Graduates and Students). "History of Modern Television," A. D. G. Wheatley. Unit Cinema, 3 (Tels.) Trng. Bn., R.E.M.E., Arborfield, Berks. 7 p.m.

I.E.E. (N.W.). Discussion: "Exchange of Ideas on Laboratory Experiments." Electrical Engineering Laboratories, Manchester University. 6.15 p.m.

I.E.E. (Sheffield). "A General Theory of Depreciation of Engineering Plant," D. Rudd. Angel Hotel, Brigg. 7 p.m.

R.S.A. Cantor Lecture: "Exports and the Country's Economy," J. L. S. Steel. John Adam St, Adelphi, W.C.2. 6 p.m.

INSTITUTION OF MECHANICAL ENGINEERS (Ind. Admin. and Eng. Production Group). Discussion: "Mechanical Handling of Small Parts With Special Reference to Automatic Assembling Equipment." 1 Birdcage Walk, Westminster, S.W.1. 6 p.m.

I.E.S. (Bath and Bristol Centre). "Lighting For Photography," R. W. Unwin. Grand Hotel, Bristol.

I.E.S. (Leeds Centre). "Continental Lighting Practice," A. W. Gostt. British Lighting Council, 24 Aire St. 6.15 p.m.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (Manchester). "Neutron Diffraction," Dr G. E. Bacon. College of Science and Technology, Manchester. 7 p.m.

BIRMINGHAM ELECTRIC CLUB. "Electro-magnetic Pumping of Liquid Metals," J. A. S. Hilditch. Grand Hotel. 5.30 p.m.

INSTITUTION OF PRODUCTION ENGINEERS (Midlands). "Technique on Fine Boring," J. R. Judkins. Craven Arms Hotel, High St, Coventry. 7 p.m.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

Atlas Refrigeration (Gt. Britain) Ltd., 1 St. Nicholas Bldgs, Newcastle upon Tyne. Nom. cap.: £100. Dirs.: Erik Jespersen, Andreas Bechman and Jens C. Holm.

R. W. Beach and Co. Ltd., 179 Bradford St, Birmingham 12. Electric fan manufacturers and dealers, etc. Nom. cap.: £3,000. Dirs.: Roy W. Beach and Valerie A. Beach.

Bull Electrical Services (Westminster) Ltd. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Peter J. Bull, 80 Harperford Ave, Virginia Water; and Simon A. F. Davies, 3-4 Berners St, W.1.

Dickinson and Parker Ltd., 35 Friern Barnet Rd, N.11. Electrical consultants, electrical engineers, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Matthew Gibb and Miss Charlotte R. Moore.

Electrical Surveys Ltd., 20 Gt. Chapel St, W.1. Surveyors and reporters of and as manufacturers of and dealers in dynamos, etc. Nom. cap.: £100. Dirs.: Terence W. Adams and Elizabeth W. M. Adams.

Energy Conversion Ltd. To carry on research work into the use and development of fuel cells and fuel cell systems and other sources of power, etc. Nom. cap.: £200,000. Dirs.: not named. Subs.: Marion Simmons and J. Bennington, 59-67 Gresham St, E.C.2.

E.R.F. Cables Ltd., 4 Castle Boulevard, Nottingham. Electrical cable manufacturers and dealers, etc. Nom. cap.: £5,000. Dirs.: Ralph Lowe and Wm. J. Combellack.

Lamp Metals Ltd., Magnet Hse, Kingsway, W.C.2. To acquire part of the undertakings of A.E.I. Lamp and Lighting Co. Ltd., and of the General Electric Co. Ltd.; to carry on business of manufacturers of and dealers in metal and metal alloys and articles made therefrom, etc. Nom. cap.: £750,000. Dirs.: not named. Subs.: George G. Bodington and D. M. Vickers.

Olympia Electrics Ltd., 630 Hyde Rd, Gorton, Manchester. Nom. cap.: £3,000. Dirs.: not named. Subs.: Dennis Glass and Sidney Sherman.

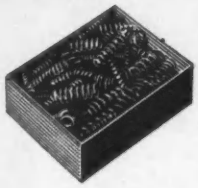
Photronic Controls Ltd. Manufacturers of and dealers in photo-electric and electronic controls, etc. Nom. cap.: £5,000. Dirs.: Robert A. Mountain. Subs.: F. M. Caporn and A. E. Posner, 2 Hare Court, E.C.4.

South Hampshire Electrical Co. Ltd., Little Timbers, Hall Lands La, Fairoak, Hants. Nom. cap.: £500. Dir.: Gordon E. W. Beaver.

Thermotex Ltd., 103 Cannon St, E.C.4. Manufacturers and distributors of flexible electrical heating pads, etc. Nom. cap.: £100. Dirs.: Donald L. Langrish-Smith and George T. Harris.

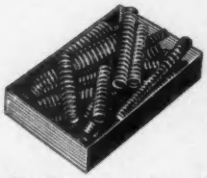
EXPERIMENTAL SPRINGS?

No. 1200. Three dozen Assorted Light Expansion Springs, suitable for carburettor control, etc. **15/-.**

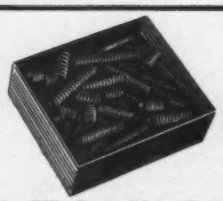


No. 98A. Three dozen Assorted ½" to 4" long, ¼" to ½" diam., 19G to 15G. **6/6.**

No. 753. Three dozen Assorted Light Expansion ½" to ½" diam., 2" to 6" long, 22 to 18 S.W.G. **12/-.**



No. 760. Three dozen Assorted Light Compression Springs. 1" to 4" long, 22 to 18 S.W.G., ¼" to ½" diam. **7/6.**



No. 757. Extra Light Compression, 1 gross Assorted, ¼" to ⅜" diam., ½" to 2½" long, 27 to 19 S.W.G. **18/-.**

No. 758. Fine Expansion Springs. 1 gross Assorted ¼" to ½" diam., ½" to 2" long, 27 to 20 S.W.G. **18/-.**

That spring you want . . . in a hurry . . . *where* is it? Pick *what* you want *when* you want it from TERRY'S BOXES OF ASSORTED SPRINGS—our fine range of small boxed assortments of experimental springs. We can show you only a few from the range here. Send a postcard for our full list—and if ever you're stuck with a spring problem send it along to our Research Department —they'll gladly help you out.

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TERRY'S *for SPRINGS*

Really interested in Springs? "Spring Design and Calculations" 10th Edition tells all—post free 12/6.

Cut Production Costs with Terry's Wire CIRCLIPS. We can supply immediately from stock—from ⅛" to ⅝".

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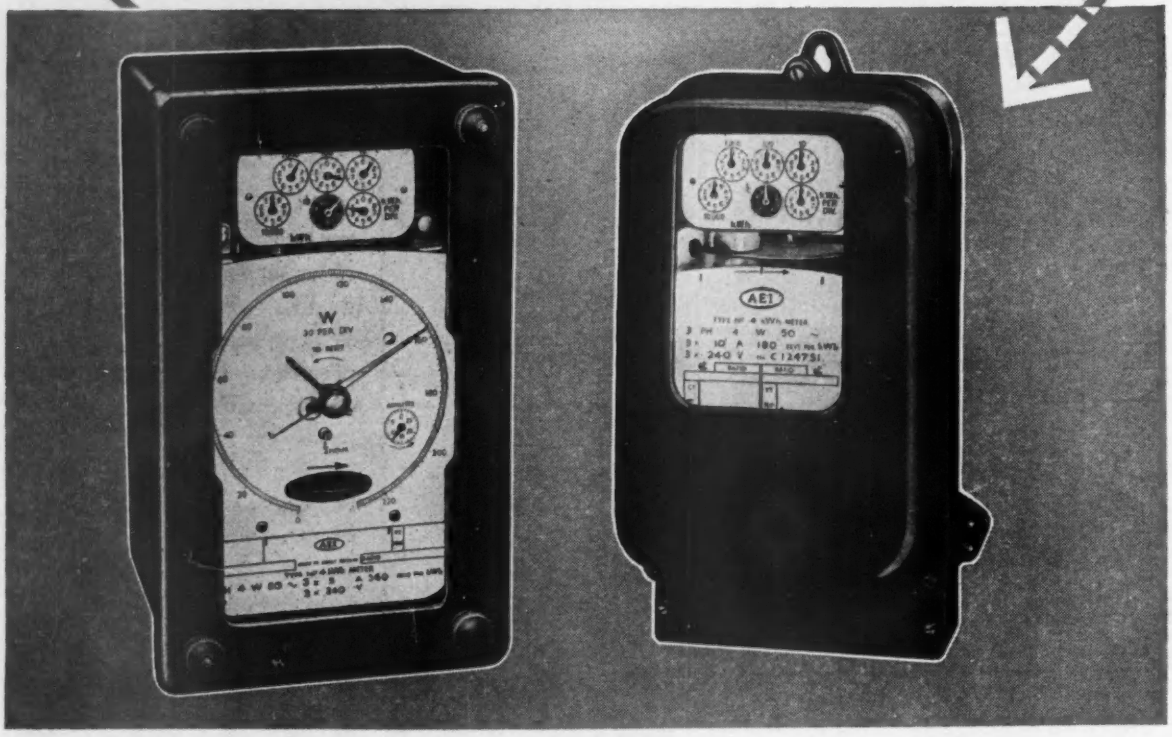
HT31

AEI INSTRUMENTATION INFORMATION SERVICE

designed for overall accuracy

TYPE NF SERIES POLYPHASE METERS



Accuracy and up-to-date design are the key features of the type **NF3** (two-element) and **NF4** (three-element) watt-hour and maximum demand meters.
Their high performance is complemented by light-weight construction, easily accessible adjustments, and attractive appearance. Available in house-service front-connected case (with or without extended terminal cover) or switchboard rear-connected case (projecting or flush mounting). Both meters comply in all respects with British Standards 37: Part 4: 1954 and Part 5: 1955.

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Associated Electrical Industries Limited

SINGLE- & POLYPHASE KWH METERS · RELAYS & PROTECTIVE SYSTEMS · AC & DC INDICATING INSTRUMENTS

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CLASSIFIED ADVERTISEMENTS

TENDERS INVITED

FEDERATION OF RHODESIA AND NYASALAND
FEDERAL POWER BOARD
KARIBA HYDRO-ELECTRIC SCHEME

FIXED TO FIXED RADIO COMMUNICATIONS EQUIPMENT

The Federal Power Board proposes to call for tenders for the supply, delivery and erection of fixed V.H.F./U.H.F. radio equipment for communication between Norton and Salisbury in Southern Rhodesia, a distance of about 19 miles.

The equipment is required initially to provide two channels in each direction for the transmission of coded intertripping (transferred trip) signals, and reliable telephone communication between the Board's substations at Norton and Salisbury.

Contractors wishing to tender should submit details of their qualifications and experience by 1 December, 1961, after which tender documents and drawings will be issued to those organisations satisfying the Board's requirements.

Applications should be sent in duplicate to the Secretary, Federal Power Board, P.O. Box 630, Salisbury, Southern Rhodesia, with a separate copy direct to the Board's Consulting Electrical and Mechanical Engineers: Messrs Merz and McLellan, Carliol Hse, Newcastle upon Tyne 1, England.

(C 500)

BOROUGH OF TAMWORTH

Street Lighting on Trunk Road A.453

TENDERS are invited for the supply, delivery, erection and wiring complete of the following:

(i) 10 No. 200 W sodium lighting units on steel columns to give 30 ft mounting height.

(ii) 2 No. 200 W sodium lighting units on steel columns to give 23 ft mounting height above an elevated footpath.

(iii) 1 No. 200 W sodium lighting unit on a steel column to give 28 ft 6 in. mounting height above an elevated footpath.

(iv) 2 No. 200 W sodium lighting units on existing columns which are to be converted to take the new lighting units.

Copies of the Contract Drawings may be inspected at the office of the undersigned, from whom copies of the Form of Tender, General Conditions of Contract and Specification may be obtained.

Tenders, in plain sealed envelopes, endorsed "Street Lighting," must be delivered to H. B. Leake, Esq., Town Clerk, Municipal Offices, Tamworth, not later than Monday, 20 Nov., 1961.

H. F. BRUCE SMITH, M.I.MUN.E.
Borough Engineer and Surveyor.

Municipal Offices,
Tamworth.
27 Oct., 1961. (C 491)

APPOINTMENTS VACANT

CORPORATION OF LONDON

APPLICATIONS are invited from suitably experienced candidates for the permanent post of

RESIDENT DEPOT SUPERINTENDENT
(MECHANICAL AND ELECTRICAL EQUIPMENT)

at the Corporation's new Public Cleansing Depot, Upper Thames St, E.C.4. Salary scale: £990/£1,310 p.a. Commencing salary according to qualifications and experience and with free flat accommodation at the Depot, available 12 months after appointment.

Candidates should hold a National Certificate in mechanical and/or electrical engineering. Preference will be given to those experienced in maintenance of industrial plant including oil-fired steam boiler plant and various types of electrical switchgear and motors.

Applications stating age, appointments held and experience, together with names of two referees, to The City Engineer, Guildhall, London E.C.2, by 14 Nov., 1961. (C 437)

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

FOURTH ASSISTANT ENGINEER
STOURPORT TRANSMISSION DISTRICT

FOURTH Assistant Engineer is required in the Stourport Transmission District. N.J.B. Agreement conditions, superannuable appointment, salary within Schedule B, Class L, Grade 9, commencing at a figure commensurate with qualifications and experience. The salary range is £1,070/£1,410 per annum.

Candidates should preferably possess a Higher National Certificate in Electrical Engineering or equivalent qualifications and should have had some experience in overhead lines and/or substations. Experience in protective gear, metering or communications would be an advantage. Successful candidate will have opportunity for interchange of duties associated with E.H.V. Transmission Plant.

Apply, quoting Vacancy No. 250/61 MR on form AE6, available from Mr S. S. Tyler, Stourport District Engineer, Central Electricity Generating Board, Stourport District Office, Worcester Rd, Stourport-on-Severn, Worcs, to be returned by 20 Nov., 1961. (C 493)

AIR MINISTRY WORKS DEPARTMENT

INVITES applications for positions as STATION ENGINEERS Grade III at R.A.F. and Ministry of Aviation establishments throughout the United Kingdom to supervise the installation, operation and maintenance of electrical and/or mechanical plant.

Salary, which is dependent upon age, quals. and exp., ranges in the U.K. from £801 (National Rate) at age 25 to £988 max. in Grade III.

Quals. and exp. Applicants, who must be natural-born British subjects up to age 35, should have served an apprenticeship and should hold an ONC or C. and G. Technical Cert. or Second Class M. of T. Cert. or equiv. Experience is required in one or more of the following:

Electrical Generation.
Electrical Distribution, H.T. and L.T.
Electrical Installations, Industrial and Domestic.
Light Current and/or Electronic Engineering.
Ventilation and Air Conditioning.
Heating and hot water supply.
Compressed gases and refrigeration.
Bulk fuel installation.
Diesel engine-driven plant.

Internal training courses provided and financial assistance and time off may be allowed for recognised courses of study leading to higher quals.

Prospects. Appointments are non-pensionable but retirement/resignation gratuity payable after five years' or more service. Excellent opportunities of obtaining permanent pensionable posts (with all service counting) and of advancement to the higher grades in which posts number 480 approx. Higher grade salaries vary between £988 and £1,747 p.a. (National Rate) and vacancies are, as a rule, filled by promotion of serving staff. Opportunities for overseas tours for which special allowances ranging at present up to £1,800 p.a. are payable in addition to a higher salary. Five-day week with 264 days' paid leave a year initially, including public holidays.

Forms from Manager (PE.1), Ministry of Labour, Professional and Executive Register, Atlantic Hse, Farringdon St, London E.C.4. Candidates selected will normally be interviewed in London and certain expenses reimbursed. Only applicants selected for interview will be advised. (C 180)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 46s. per inch, and all other classified advertisements at 3s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

CENTRAL ELECTRICITY GENERATING BOARD

South Thames Division

RICHBOROUGH GENERATING STATION

APPLICATIONS are invited for the following appointments at Richborough Generating Station, at present being constructed on the Kent coast between Ramsgate and Sandwich.

The ultimate capacity of the Station is three 120 MW reheat units.

FIVE SHIFT CHARGE ENGINEERS

Vacancy No. 271/61.

Applicants should have had considerable operational experience in a large modern power station.

Salary: N.J.B. Class K, Grade 6, £1,584/£1,771 per annum including shift allowance.

TEN ASSISTANT SHIFT CHARGE ENGINEERS

Vacancy No. 272/61.

Applicants should have had considerable operational experience in power stations.

Each successful applicant will be employed in the Central Unit Control Room and on general duties within the power station for equal periods.

Salary: N.J.B. Class K, Grade 8, £1,402 10s/£1,551 per annum including shift allowance.

ASSISTANT ENGINEER (DRAUGHTSMAN)

Vacancy No. 273/61.

The successful applicant will be responsible for production of mechanical, electrical and civil drawings originated at the station, and for the custody of all drawings supplied to the station.

The probable date of this appointment will be 1 Feb., 1962.

Salary: N.J.B. Class K, Grade 12, £965/£1,090 per annum.

Applications giving age, details of experience, qualifications, etc., and quoting Vacancy No. should be sent to the Personnel Officer, Central Electricity Hse, Lower Ham Rd, Kingston upon Thames, Surrey, to arrive by 20 Nov. (C 516)

YORKSHIRE ELECTRICITY BOARD

Head Office:

THIRD ASSISTANT ENGINEER

DISTRIBUTION DESIGN (SUBSTATIONS)

DUTIES will include the design of indoor and outdoor substations operating at voltages of 33 kV and above, the preparation of specifications for substation plant and subsequent negotiations with plant manufacturers. They will also cover protective gear applications on the primary h.v. system.

Applications are invited from Engineers having a sound general knowledge of substation plant and some experience of field construction.

Salary: N.J.B. Class K, Grade 8 (transitional to Scale 11), within the range of £1,145/£1,410 per annum. The commencing salary will be dependent upon qualifications and experience.

Applications, together with the names of two referees, should be sent to the Secretary, Yorkshire Electricity Board, Wetherby Rd, Scarcroft, Leeds, not later than 24 Nov., 1961

No. 2 (Huddersfield) Sub-Area

HALIFAX DISTRICT

GENERAL ASSISTANT DISTRICT ENGINEER

(DRAUGHTSMAN)

Applicants should have had a good general and technical education. The successful candidate will be responsible for the supervision of the District Mains Records Drawing Office, and will be required to prepare plans for capital schemes, wayleaves and statutory notices.

Salary: N.J.B. Class J, Grade 14 (Scale 4), £765/£870 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market St, Huddersfield, not later than 24 Nov., 1961. (C 507)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Project Group

ASSISTANT ENGINEERS (DRAWING OFFICE)

APPLICATIONS are invited for the following appointments in the Drawing Office of the Midlands Project Group at Bournville, Birmingham:

(A) FOURTH ASSISTANT ENGINEER

(CIVIL)

Salary Scale 10 of the National Joint Board (£1,070/£1,325 per annum).

(B) GENERAL ASSISTANT ENGINEERS

(CIVIL)

Salary within either Scale 8 (£920/£1,165), Scale 7 (£840/£1,090), or Scale 5 (£690/£940 per annum) of the National Joint Board Agreement.

Applicants should have received a sound practical and technical training and possess or be working towards a suitable professional qualification.

Applications should be made on Form AE6, available from the Administrative Officer, Central Electricity Generating Board, Midlands Project Group, P.O. Box No. 314, Birmingham 30, and should be returned to him not later than 22 Nov., 1961.

Envelopes should be marked "Confidential —Staff Vacancy Notice, No. MPG.67/61." (C 519)

Eastern Electricity

Norfolk Sub-Area Headquarters

SECOND ASSISTANT ENGINEER

(PLANNING AND DEVELOPMENT)

228/61.R.

APPLICANTS should have a thorough knowledge of substation design and have had a wide experience in the planning and development of underground and overhead distribution systems up to and including 33 kV.

The duties include budgetary control of capital expenditure and programming of engineering schemes.

Candidates should be Corporate Members of the Institution of Electrical Engineers or possess equivalent qualifications, and be accustomed to controlling staff.

Salary: N.J.B. Class K, Grade 7, £1,350/£1,500.

Apply by letter to the Manager, Norfolk Sub-Area, Eastern Electricity, 4 Duke St, Norwich, Norfolk, NOR.23A., by 24 Nov., 1961.

Essex Sub-Area

CHELMSFORD DISTRICT

THIRD ASSISTANT ENGINEER

226/61.R.

Applicants should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary: N.J.B. Class G, Grade 9, £965/£1,090.

Apply by letter to D. H. Walker, A.M.I.E.E., Manager, Chelmsford District, Eastern Electricity Board, Anchor St, Chelmsford, Essex, by 20 Nov., 1961.

Northmet Sub-Area

THIRD ASSISTANT ENGINEER

HENDON DISTRICT

(Ref. 1023) 229/61.R.

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary: N.J.B. Class H, Grade 9, £1,090/£1,215, including London Allowance.

Apply by letter, quoting reference ET, to F. A. Moinet, M.I.E.E., A.M.B.I.M., Manager, Eastern Electricity, 137-9 Brent St, Hendon, by 24 Nov., 1961. (C 522)

SOUTH EASTERN ELECTRICITY BOARD

SENIOR ASSISTANT ENGINEER

(PLANNING AND DEVELOPMENT)

AT SURREY SUB-AREA HEADQUARTERS

DORKING, SURREY

SALARY: £1,795/£1,950 per annum in accordance with N.J.B. Class I, Grade 4. Superannuable. Consideration will be given to a car allowance and to assistance with house purchase in appropriate circumstances. The appointed person will take charge of the Planning and Development section and will be responsible to the Sub-Area Engineer for the preparation of short- and long-term plans for the development of major transmission and distribution throughout the Sub-Area, together with the co-ordination of District H.V. and M.V. planning proposals. Corporate membership of the I.E.E. is desirable and candidates should have extensive responsible practical experience of distribution works up to 33 kV, in addition to technical planning experience. Surrey Sub-Area, covering some 400 square miles, supplies 309,000 consumers and has a maximum demand of 464 MW. It is predominantly residential in character with extensive light industry being partly densely suburban and partly rural. Applications, quoting ET, on forms from Surrey Manager, Seeboard, Rough Rew, Ridgeway Rd, Dorking, Surrey, by 22 Nov., 1961.

ASSISTANT DISTRICT ENGINEER

GUILDFORD DISTRICT

Salary: £1,040/£1,165 under N.J.B. Class F, Grade 7. Superannuable. Preference given to applicants with technical qualifications up to H.N.C. standard and with practical experience of the planning, construction, operation and maintenance of M.V. and 11 kV underground and overhead systems. Consideration will be given to a private car allowance and assistance in house purchasing in appropriate circumstances. The successful applicant will be required to undertake standby duties. Applications, quoting ET, on forms from District Manager, Seeboard, Woodbridge Rd, Guildford, Surrey, by 22 Nov., 1961.

SHOWROOM ASSISTANT

CROYDON AND PURLEY DISTRICT

Annual salary, including London Allowance, £285 at 16 to £490 at 20, rising to £600, £680 or £740 according to qualifications obtained and ability. Duties will include general showroom work and the advising of consumers on the use of electrical apparatus. The successful applicant may be required to work in any showroom of the Croydon and Purley district. He may also be required to carry out cashier duties. Applications, quoting ET, and naming two referees on forms from District Manager, Seeboard, Electric Hse, Wellesley Rd, Croydon, by 22 Nov., 1961.

GEORGE WRAY,
Secretary.
(C 520)

LONDON ELECTRICITY BOARD

ASSISTANT DISTRIBUTION ENGINEER

APPLICATIONS are invited for the above position in the Board's Northern District at 18/24 Lower Clapton Rd, E.5.

Applicants must have had a thorough theoretical and practical training and should have had comprehensive experience of development, construction and maintenance of L.V. and H.V. distribution systems, together with the associated administrative work and the control of labour. Corporate or Graduate Membership of the Institution of Electrical Engineers, or the equivalent, would be an advantage.

The post is graded under Schedule A of the National Joint Board Agreement as Class J, Grade 7, £1,325 rising to £1,460 per annum, inclusive of London Allowance.

Applications, stating age, qualifications and experience, should be sent to the Manager at the above address, within 14 days of the publication date of this notice. Please quote reference PER/V/3437/T. (C 512)

THE NORTH WESTERN ELECTRICITY BOARD

SECOND ASSISTANT ENGINEER

MAINS CONSTRUCTION SECTION

SUB-AREA ENGINEERING DEPARTMENT

MANCHESTER

THE duties will include the organisation and supervision of mains construction work in the Sub-Area at voltages up to and including 33,000 volts. Applicants should have had considerable experience in the installation and maintenance of underground cable systems in a city area, and have a sound knowledge of cable techniques. Applicants should hold the H.N.C. in Electrical Engineering or its equivalent. Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary Scale: £1,535/£1,720 p.a. Grade M.7. N.J.B. Conditions.

FOURTH ASSISTANT DISTRICT

COMMERCIAL ENGINEER (INSTALLATION)

NORTH WEST DISTRICT, ECCLES

Applicants should have had experience in the control and supervision of industrial and domestic contract wiring, including preparation of estimates and specifications, together with delivery and connection.

Salary Scale: £890/£1,015 p.a. Grade H.11. N.J.B. Conditions.

Applications on forms to be obtained from the Manager (Staff Vacancy), No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester 2, P.O. Box 493, and returned to him by 20 Nov., 1961.

FOURTH ASSISTANT ENGINEER

SUB-AREA ENGINEERING DEPARTMENT

PRESTON

Applicants must have had sound training in the testing and maintenance of protective gear.

Preference will be given to applicants who hold the H.N.C. in Electrical Engineering.

Salary Scale: £965/£1,090 p.a. Grade L.13. N.J.B. Conditions.

Applications on forms to be obtained from the Manager, No. 4 Sub-Area, The North Western Electricity Board, 40-41 Lime St, Preston, and returned to him by 23 Nov., 1961. (C 497)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region

North Thames Division

APPLICATIONS are invited for the following appointment at West Thurrock Generating Station (Grays, Essex):

ASSISTANT MAINTENANCE ENGINEER

(INSTRUMENTS)

(S.V. No. 1558)

Salary: N.J.B., Class M, Grade 12, Scale 9, £1,115/£1,245, plus London Weighting £50 per annum, rising eventually to Class N, Grade 12, Scale 10, £1,190/£1,325 per annum, plus London Weighting £50 per annum.

Suitable candidates must have a thorough knowledge of general electronics, with an emphasis on pulse circuit technique. An understanding or experience of instrumentation and/or transistors will be an advantage. His practical training should be preferably either an apprenticeship with a major radio firm, or ex Royal Air Force Radar Mechanic. Technical qualifications would be an advantage. The post is intended for a technician whose duties will include the maintentance of a Ferranti Argus Digital Computer and its peripheral equipment.

Applications, quoting Reference S.V. No. 1558, stating age, qualifications, experience and present position, should be sent to the Assistant Regional Personnel Officer, Central Electricity Generating Board, South Eastern Region, North Thames Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, to arrive not later than 23 Dec., 1961.

F. W. SKELCHER,
Assistant Regional Director.
(C 494)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Edinburgh and Borders Area

THIRD ASSISTANT ENGINEER

(PLANNING AND DEVELOPMENT)

AREA HEADQUARTERS

DEWAR PLACE, EDINBURGH

SALARY: N.J.B. Schedule A, Class L, Grade 10, Salary Scale No. 10 £1,190/£1,325 p.a.

Applications on the standard form, obtainable from the undersigned or any other Area Manager, should be submitted not later than 27 Nov., 1961.

Applicants for this superannuable appointment should have a sound engineering training and experience in the design and layout of densely loaded distribution networks in city areas and rural systems at pressures up to and including 33 kV; the application of modern protective equipment and of the calculation and preparation of load flow diagrams and fault levels. Applicants must also possess as a minimum qualification a Higher National Certificate in Electrical Engineering or its equivalent.

Conditions of service will be in accordance with the National Joint Board Agreement for the Electricity Supply Industry. The successful candidate will require to reside within a reasonable distance of Area Headquarters.

C. H. A. COLLYNS,
Manager.

52 Melville St,
Edinburgh 3. (C 503)

MIDLANDS ELECTRICITY BOARD

FOURTH ASSISTANT ENGINEER (CIVIL)

REQUIRED at Central Gloucestershire Area Office.

Applicants should have building and civil engineering experience and a knowledge of quantities. Possession of suitable qualifications will be an advantage. Duties include the supervision of contracts and direct labour and the ordering of materials, etc., for offices, service centres, stores and general building and maintenance work.

Salary: £890/£1,015 per annum (N.J.B. Grade K.13). Superannuable.

Apply, by letter, within 14 days, stating age, experience, qualifications, present position and salary, to Mr S. Raybould, Area Manager, Midlands Electricity Board, Eastern Ave, Gloucester.

F. W. CATER,
Secretary.
(C 492)

THE NORTH WESTERN ELECTRICITY BOARD

SUB-AREA COMMERCIAL OFFICER

No. 6 SUB-AREA, KENDAL

APPLICATIONS are invited for the above post from suitably qualified engineers. A wide knowledge of industrial, commercial, rural and domestic electrification is essential. Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Conditions of employment will be in accordance with the National Joint Managerial and Higher Executives Grades Agreement and the salary will be Class C, Grade 5, of that Agreement (£2,170/£2,380 per annum).

Applications on forms to be obtained from the Secretary, The North Western Electricity Board, Cheetwood Rd, Manchester 8, and returned to him by 22 Nov., 1961. (C 498)

CENTRAL ELECTRICITY GENERATING BOARD

Southern Project Group

TECHNICAL CLERK

APPLICATIONS are invited for the position of Technical Clerk in the Programme Engineer's Department at Project Group Headquarters, Squires La, Finchley, London N.3.

The work will be connected with the preparation of engineering design standards and associated activities. The duties will be to assist in the collation and classification of a wide range of civil, mechanical and electrical data and to maintain a library of technical information.

The successful candidate should have had a good general education, possess an inquiring mind and be painstaking and thorough in attitude.

The salary will be within Grade 2 of the National Joint Council Agreement, i.e., £740/£815 per annum, inclusive of London Allowance.

Applications stating age, experience, present position and salary should be forwarded to the Administrative Officer, Central Electricity Generating Board, Southern Project Group, Squires La, Finchley, London N.3, so as to arrive not later than 15 Nov., 1961.

Envelopes should be marked "CONFIDENTIAL—S/61/24." (C 490)

CENTRAL ELECTRICITY GENERATING BOARD

Southern Division

South Western Region

GRADE 10 ENGINEER

POOLE GENERATING STATION

THE successful applicant will be given the opportunity of gaining experience in oil-fired plant operation, control room duties and maintenance work. Operating experience of modern generating station plant is essential.

Preference will be given to those possessing qualifications leading to membership of a recognised professional institution or equivalent qualifications.

Salary: N.J.B. Grade K/10, Scale 9, £1,115/£1,245.

Special application froms obtainable only from Divisional Secretary, 111 High St, Portsmouth, should be returned by 22 Nov., 1961.

(C 502)

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Region

FOURTH ASSISTANT ENGINEERS

(SUBSTATIONS)

APPLICATIONS are invited from Engineers to supervise the work of contractors engaged on the installation of transformers, switchgear, cables and associated equipment at transmission substations based on Leeds.

Previous experience of this work is desirable but not essential.

Varied and interesting developments are taking place in the Region on the introduction of the 400 kV system which candidates will in time be expected to supervise.

Preference will be given to candidates who possess or are completing qualifications leading to Corporate Membership of the I.E.E.

The salary for the appointment will be in accordance with the National Joint Board Agreement, Grade 11, Class K (£900/£1,165 per annum).

Forms of application may be obtained from the Regional Personnel Officer, Central Electricity Generating Board, North Eastern Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than 20 Nov., 1961. (C 501)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Aberdeen Area

APPLICATIONS are invited for the post of

GENERAL ASSISTANT ENGINEER

(TECHNICAL)

Duties will include assisting with radio and line telephony, supervisory control and other communication systems.

Ordinary National Certificate or equivalent qualification and some experience of maintenance of light-current equipment required.

Salary commencing within range £715/£940 per annum. N.J.B. Class H.14/12. Superannuation scheme available.

Application forms should be returned not later than 16 Nov., 1961, to the Area Manager, North of Scotland Hydro-Electric Board, Millburn St, Aberdeen. (C 484)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

Staff Vacancy

No. 4 Sub-Area

ASSISTANT SECTION ENGINEER

REQUIRED at Machynlleth. Salary within the range £825/£940 per annum (N.J.B. E.9, Scale 5).

Applicants should preferably have had experience in the construction, operation and maintenance of overhead and underground high and medium voltage networks with their associated substations and equipment.

Appointment subject to medical examination. Pension Scheme.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity Hse, Rhostyllen, nr. Wrexham.

Closing date: 24 Nov., 1961. (C 509)

SOUTHERN ELECTRICITY BOARD

ASSISTANT ENGINEER (PLANNING)

YEOVIL District of No. 4 (Bournemouth) Sub-Area. Salary: N.J.B. Class G, Grade 11 (£825/£940 per annum). N.J.B. Conditions of Service.

The successful candidate will be required to assist in the preparation of schemes and estimates for extensions of, and reinforcement to, overhead and underground H.V. and L.V. networks. Applicants should have had sound experience in Electricity Supply Distribution, and the possession of suitable technical qualifications would be an advantage. The successful candidate will be required to carry out standby duties if and when called upon to do so.

The successful applicant will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 1 Priory Rd, Bournemouth, and returned to him, quoting Z.1431, not later than 20 Nov., 1961. (C 508)

ADEN GOVERNMENT

Electricity Department

ASSISTANT MAINS ENGINEERS

REQUIRED on contract for one tour of 18-24 months in first instance. Salary (including Inducement Allowance) according to age and experience, in scale rising to £2,295 a year. Gratuity at rate of 12½% of total salary drawn. Children's education allowances. Free passages.

Candidates, preferably under 45 years of age, must have had sound technical training and subsequent experience in design and construction of overhead and underground distribution systems, up to and including 33 kV. Apply to CROWN AGENTS, 4 Millbank, London S.W.1, for application form and further particulars, stating age, name, brief details of qualifications and experience and quoting reference M2A/51474/EE. (C 496)

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

ASSISTANT ENGINEER (CONTROL)

REQUIRED at Nechells "A" and "B" Power Stations. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K.14, £825/£940 per annum plus 10% shift allowance (minimum £90).

Applicants should have received a sound technical and practical training and should preferably possess suitable technical qualifications. Duties will be in connection with the control of steam generating plant and main switchgear.

Apply, quoting Vacancy No. 252/61MR on form AE6, available from the Station Superintendent, Nechells Power Station, off Aston Church Rd, Nechells, Birmingham 7, to be completed and returned by 20 Nov., 1961. (C 510)

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

STATION SHIFT CONTROL ENGINEER

REQUIRED at Nechells "A" and "B" Power Stations, Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule A of the Agreement, Grade K.10, £1,115/£1,245 per annum, plus 10% shift allowance.

A sound technical training and practical experience in the control of steam generating plant and main switchgear are required. Appropriate technical qualifications an advantage.

Apply, quoting Vacancy No. 251/61MR on form AE6, available from the Station Superintendent, Nechells Power Station, off Aston Church Rd, Nechells, Birmingham 7, to be completed and returned by 20 Nov., 1961. (C 511)

CENTRAL ELECTRICITY GENERATING BOARD

South Thames Division

NORTHFLEET POWER STATION

ASSISTANT ENGINEER (SHIFT)

Vacancy No. 269/61.

THIS position is for general operational duties on shift, and relevant experience within a modern generating station is required.

Salary: N.J.B. Class M, Grade 10, £1,452 10s/£1,601, including London and shift allowances.

Applications giving age, details of experience, qualifications, etc., should be sent to the Station Superintendent, Northfleet Power Station, Crete Hall Rd, Northfleet, Kent, to arrive by 17 Nov. (C 515)

WANTED

ELECTRICAL ENGINEER

(aged about 30-35)

for estimating and supervising electrical contracts. Good salary and bonus paid to keen, energetic man capable of accepting responsibility. Permanent position with pension. Assistance with housing, if necessary. Applications in writing (stating age, experience, technical qualifications and salary required) will be treated with strictest confidence and should be made to:

Messrs A. ANDERSON AND SON (ELECTRICAL ENGINEERS) LTD.,
100 Grange Rd,
MIDDLESBROUGH.

(C 475)

CROMPTON PARKINSON LIMITED

SERVICE ENGINEER

LONDON AREA

An intelligent young man in the 20-25 years' age group, resident in the London area, is required as a Service Engineer.

He should have had practical experience in the manufacture, maintenance or repair of fractional motors, and must have a knowledge of electrical machinery.

Preference will be given to applicants with a Higher National Certificate in electrical engineering, but consideration will be given to those with Ordinary National Certificate who are prepared to continue their studies at evening classes.

This appointment will carry a good starting salary and is progressive and pensionable.

Apply by letter, giving all essential details, to The Chief Personnel Officer, Crompton Parkinson Ltd., Crompton Hse, Aldwych, W.C.2. (C 487)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Region

East Midlands Division

ASSISTANT ENGINEER (CONTROL ROOM)

LEICESTER POWER STATION

Vacancy No. 235/61.

APPLICATIONS are invited for the position of Assistant Engineer (Control Room) at Leicester Power Station, Rawdykes Rd, Leicester.

Candidates for this post should be suitably qualified and have had experience in the control room.

Salary will be in accordance with Class G, Grade 13 (£715/£805 per annum), of the National Joint Board Agreement, plus £90 per annum allowance whilst engaged on shift duties.

Closing date for receipt of applications: 17 Nov., 1961.

This appointment is pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Station Superintendent and should be returned to him by the date stated.

O. S. WOODS,
Assistant Regional Director.
(C 514)

TECHNICAL OFFICER

The British Electrical Development Association requires a Technical Officer specially expert in promoting the use of electricity for domestic purposes. Ability to write fluently and clearly is essential. Knowledge of publicity and film making very advantageous. Corporate membership of I.E.E. desirable. Salary in the region of £2,000 depending on age and qualifications. Applications, giving full particulars of education, training, qualifications, age and experience to be sent before 1 Dec., to:

Director and Secretary,
The British Electrical Development Association,
2 Savoy Hill, London W.C.2.
(C 499)

DRAUGHTSMEN

required in long established and progressive company. Permanent and progressive position offered to men holding O.N.C. or equivalent who are used to producing a high standard of work and with experience in design layout and detailing in either of the following fields:

A.C. and D.C. electrical machines
Motor control gear and panels.

Details of qualifications and experience should be sent to the

General Manager,
Newton Brothers (Derby) Ltd.,
Alfreton Rd, Derby.

(C 449)

J. & P.

Cable Sales Engineers

Johnson and Phillips Ltd. invite applications from Sales Engineers for responsible senior positions in Yorkshire and Lancashire. Applications giving age and full details of experience to:

A. F. Herbert, Manager,
Johnson and Phillips Ltd.,
Norfolk Hse, Norfolk St,
Manchester 2.

(C 525)

LONDON ELECTRICITY BOARD

VACANCY:

ASSISTANT DISTRIBUTION ENGINEER

APPLICATIONS are invited for the above position in the Board's Ravensbourne District at 293-295 Kirkdale, Sydenham, S.E.26.

Applicants should have a sound technical education to the standard of the Higher National Certificate and possess practical experience in all branches of engineering work associated with the organisation of a District distribution department.

The post is graded under Schedule A of the National Joint Board Agreement as Class J, Grade 9, £1,165 per annum rising to £1,295 per annum, inclusive of London Allowance.

Applications should be sent direct to the Manager, Ravensbourne District, at above address, within 14 days of the publication date of this notice. Please quote reference PER/V/3438/T. (C 513)

THE EAST MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified and experienced persons for the following appointment. Applicants should state age, qualifications, experience, etc., and quote the vacancy number.

Lincolnshire Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER

BOSTON DISTRICT

Re-advertised Vacancy No. 104/61.

Salary: N.J.B. Class F, Grade 9, £890/£1,015 per annum.

The duties will include assisting in the operation, maintenance, planning and construction of rural and urban networks up to and including 11 kV.

The person appointed will be required to live in or near Boston and to undertake standby duty.

Applications should be forwarded to the Manager, Lincolnshire Sub-Area, North Hse, Grantham, Lincs, by 24 Nov., 1961. (C 518)

CENTRAL ELECTRICITY GENERATING BOARD
Western Division

STATION CHEMIST REQUIRED AT CASTLE MEADS POWER STATION
GLOUCESTER
W/AV/109/61.

Superannuation Scheme. Salary: N.J.B. Class E, Grade 7, Scale 7, £965/£1,090 per annum.

Candidates should preferably possess the H.N.C. in Chemistry or equivalent qualification and should be acquainted with the chemical services appropriate to a medium pressure generating station. Supervision of the work and progress of Trainee Chemists will also be required.

STATION SHIFT CHARGE ENGINEER REQUIRED AT CASTLE MEADS GENERATING STATION, GLOUCESTER
W/AV/110/61.

Superannuation Scheme. Salary: N.J.B. Class E, Grade 7, Scale 7, £965/£1,090 per annum, plus 10% shift allowance.

Applicants should have had considerable experience in modern power station operation and preferably be Graduate or Corporate Members of a recognised Engineering Institution or possess equivalent qualifications.

Previous applicants need not re-apply.

MAINTENANCE ENGINEER (ELECTRICAL) REQUIRED AT PORTISHEAD "B" GENERATING STATION
W/AV/111/61.

Superannuation Scheme. Salary: N.J.B. Class K, Grade 5, Scale 14, £1,535/£1,720 per annum.

Applicants should have had wide experience in the maintenance of modern generating plant, and should preferably possess Associate Membership of an appropriate engineering Institution or equivalent.

ASSISTANT ENGINEER (INSTRUMENTS) REQUIRED AT BERKELEY NUCLEAR POWER STATION
W/AV/112/61.

Superannuation Scheme. Salary: N.J.B. Class M, Grade 12, Scale 9, £1,115/£1,245 per annum.

Applications are invited for the above post from men with a thorough theoretical and practical knowledge of electronic equipment and its servicing.

The successful applicant will be engaged on high-grade servicing of all electronic and semi-conductor devices associated with nuclear reactors. The duties will also include assisting in the training of Instrument Mechanics in the electronics field. Opportunities will be provided for gaining experience in conventional power station equipment.

Candidates should preferably be in possession of the H.N.C. (Elect.) or equivalent.

Applications for these appointments, on Form AE6/ACT, obtainable from the Personnel Department, 26 Oakfield Rd, Bristol 8, should be completed and returned by 22 November, 1961. (C 523)

LONDON ELECTRICITY BOARD

ASSISTANT DISTRIBUTION ENGINEER

APPLICATIONS are invited for the above position in the Board's West End District at 25 Eccleston Pl, S.W.1.

Applicants should have had a sound technical education to the standard of the Higher National Certificate and possess practical experience in all branches of engineering work associated with the organisation of a District distribution department.

The post is graded under Schedule A of the National Joint Board Agreement as Class K, Grade 11, £1,090 per annum rising to £1,215 per annum, inclusive of London Allowance.

Applications, stating age, qualifications and experience, should be sent to the Manager at the above address, within 14 days of the publication date of this notice. Please quote ref.: PER/V/3424/T. (C 485)

BRITISH ENGINE BOILER AND ELECTRICAL INSURANCE CO. LTD., Longridge Hse, Manchester 4. ELECTRICAL SURVEYORS required in England and Scotland. Permanent positions carrying progressive salary scale £825/£1,225 with non-contributory pension. Candidates aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E. and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply, stating age, qualifications and experience. (C 482)

BP has a vacancy for a SENIOR ELECTRICAL DRAUGHTSMAN at its Head Office in London. Applicants, aged 25-35, should have completed an apprenticeship in Electrical Engineering and be in possession of H.N.C. (Electrical) or equivalent and have had experience on electrical installations for process plants, workshops and factories. This work will involve visits to Company installations in the U.K. and overseas. Salary according to age and experience. Non-contributory Pension Scheme. Removal and settling-in allowances payable in certain cases. Luncheon Club. Write, quoting reference H.5244C, to Box 6885, c/o Hanway Hse, Clark's Pl, E.C.2. (C 483)

CONSULTING ENGINEERS require SENIOR ELECTRICAL DESIGNER (Building Services) capable of planning and designing services, all types buildings, including boiler houses, etc., with minimum supervision. Junior also required. Send details: Hoare, Lea and Ptnrs., Building 332 (South Side), R.A.F., Northolt, Ruislip, Middx. (C 504)

FITTER (ELECTRICAL) required for maintenance work at Drakelow Transmission District. The rate of pay is 5s 6½d per hour and terms and conditions of service in accordance with the N.J.I.C. Agreement. A house will be available for the successful applicant.

Applications should be forwarded to the District Engineer, Central Electricity Generating Board, Drakelow Transmission District, Drakelow Power Station, Burton-on-Trent, Staffs. Please quote Vacancy No. 239/61. (C 521)

REQUIRED by old-established firm of electrical engineers and contractors, a CONTRACTS ENGINEER for permanent overseas position. Able to take charge of office at manager level. Must have experience of estimating, contract management, administration of U.K. and local labour. Applicants must produce evidence of their experience. Applicants should state completely their experience, salary expected and at least three references. Application should be marked Private and Confidential, reference C.E.—Box 8471, Electrical Times. (C 524)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

TECHNCICAL SALES ENGINEER. A progressive and rapidly expanding company, manufacturing automatic control gear, requires a specialist Sales Engineer for the North Midland and Northern England territory for Rotary Switch sales. Essential qualifications should include knowledge of contemporary Rotary Switches, plus existing trade connections in the electrical industry, electronics, machine tool and computer fields, plus ability to negotiate at all levels. Attractive commencing salary, plus non-contributory pension scheme and Company car provided, plus ample opportunities for advancement.

Applicant should reside in or near Manchester, Sheffield or Nottingham areas.—Box No. 8465, Electrical Times. (C 489)

PATENTS

THE proprietor of British Patent No. 758,138, entitled "Electric Discharge Rectifier System," offers same for licence or otherwise to ensure practical working in Great Britain. Inquiries to Singer, Stern and Carlberg, 140 So. Dearborn St, Chicago 3, Illinois, U.S.A. (C 444)

WANTED

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of second-hand machinery and plant for re-use.—W. and H. Cooper Ltd., 17 Brady St, Bethnal Green, E.1. (C1)

WANTED

LARGE SINGLE PHASE ALTERNATOR

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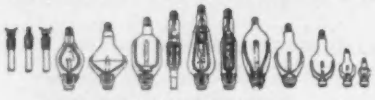

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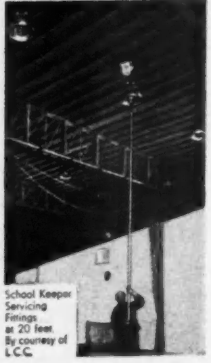

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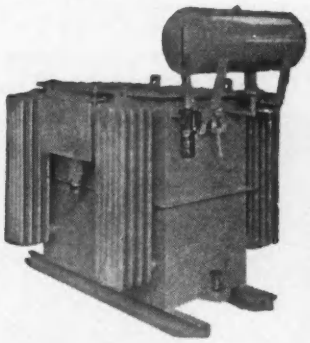

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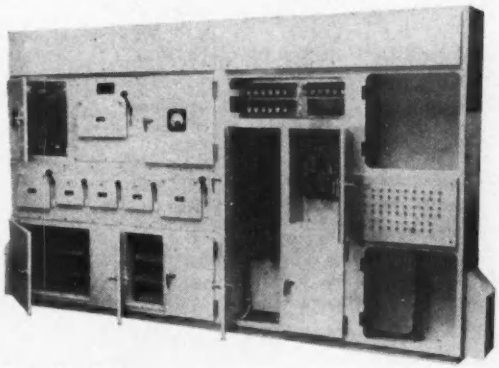

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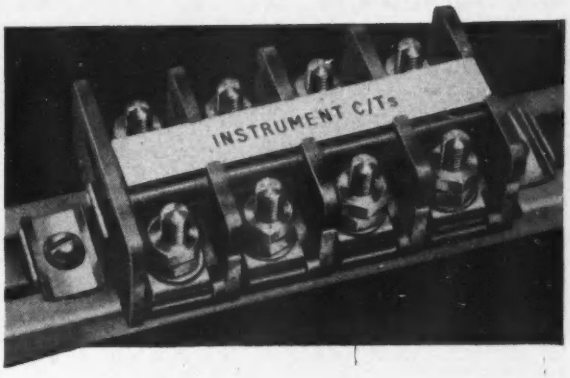

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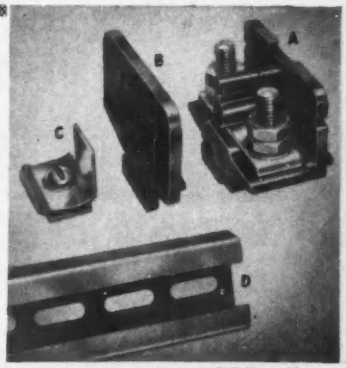

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INDEX TO ADVERTISERS

Albright & Wilson (Mfg.) Ltd. 8
Alcan (U.K.) Ltd. 13
Allen, John & Sons (Oxford) Ltd. ... 18
Ascot Lamps & Lighting Ltd. 34
Ashley Accessories Ltd. 31
Associated Electrical Industries Ltd. (Instrumentation Division) 46
Automotive Engineering Ltd. 2

Bastian & Allen Ltd. 16
Benjamin Electric Ltd. 17
Birmingham Aluminium Casting (1903) Co., Ltd. 38
British Insulated Callender's Cables Ltd. 37
British Klockner Switchgear Ltd. ... 18
Brookhurst Igranic Ltd. 12
Bulpitt & Sons Ltd. ... ... *Cover* (iv)

Cable Strippers Ltd. 52
Christy Bros. Ltd. 53
Critchley Bros. Ltd. 53
Cryselco Ltd. 59
C.T.L. Wires & Cables Ltd. 5

Dorman & Smith Ltd. 39
D.R. Illuminations Ltd. 27

Ekco-Ensign Electric Ltd. 33
E.C.C. (Moulded Breakers) Ltd. *Cover* (ii)
Electrical Apparatus Co. Ltd. 6
Electrical Times Ltd. ... 24, 54, 56, 58
Elliott, F. Ltd. 36
English Electric Co. Ltd. ... 9, 23
Evans & Newall Ltd. 16

Ferranti Ltd. 32
Formica Ltd. 30

General Electric Co. Ltd. ... ... 26, 28, 42, 55, 60, *Cover* (i)

Imperial Chemical Industries Ltd. ... 35
International Synthetic Rubber Co. Ltd. 44

Klaxon Ltd 27

Llandaff Engineering Co. Ltd. 56

Metallic Seamless Tube Co. Ltd. ... 16
Metway Electrical Industries Ltd. ... 58

Nalder Bros & Thompson Ltd. ... 58
New Switchgear Construction Co. Ltd. 34

Ottermill Switchgear Ltd. 1

Parmiter Hope & Sugden Ltd. ... *Cover*(iii)
Parsons, C.A. & Co. Ltd. 29
Permali Ltd. 40
Pirelli-General Cable Works Ltd. 10, 11
Power Centre Co. Ltd. 19
Preformed Line Products (Gt. Britain) Ltd. 7

Revo Electric Co. Ltd. 14, 15
Reyrolle, A. & Co. Ltd. 3

Saxonia Electrical Wire Co. Ltd. ... 58
Simmonds & Stokes (Niphan) Ltd. ... 56
Simon-Carves Ltd. 57
Simplex Electric Co. Ltd. 43
Sturdy Electric Ltd. 53

Terry, Herbert & Sons Ltd. 45
Thorn Electrical Industries Ltd. ... 25

Wiggin, Henry & Co. Ltd. 20
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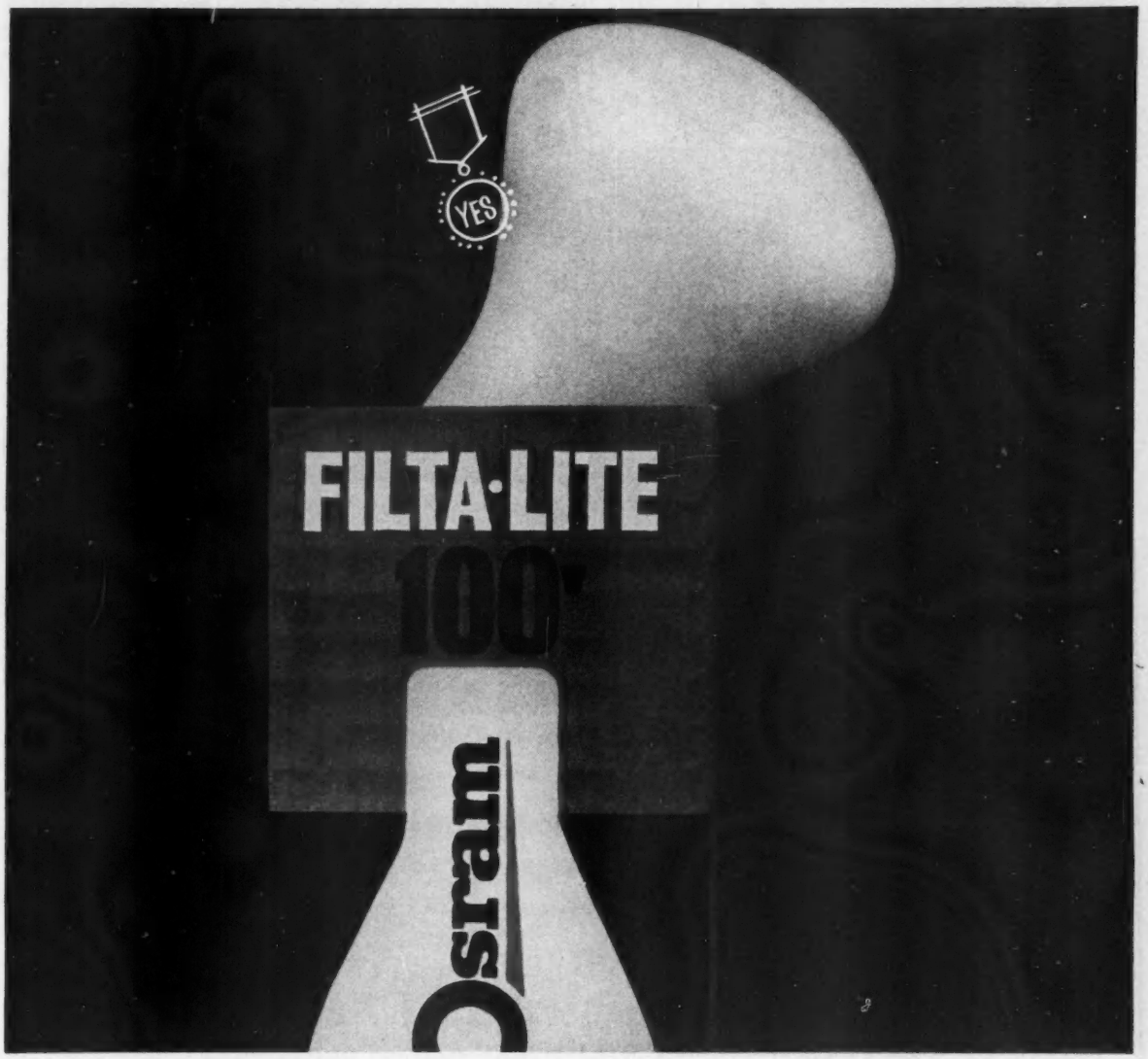

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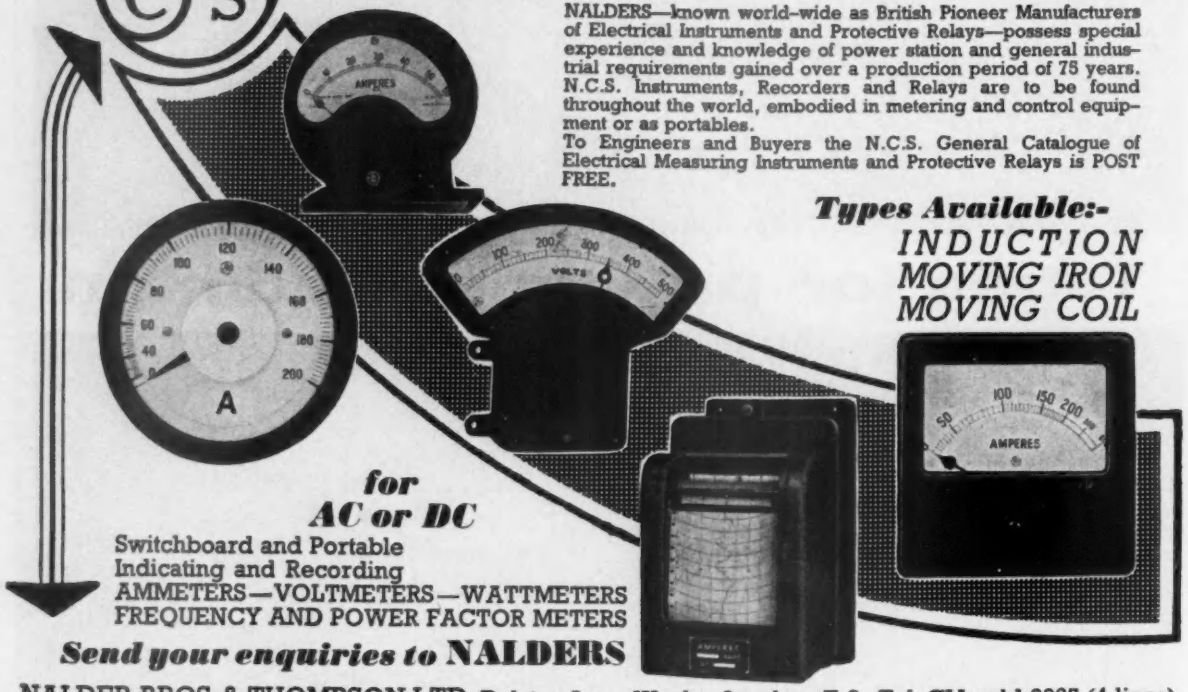

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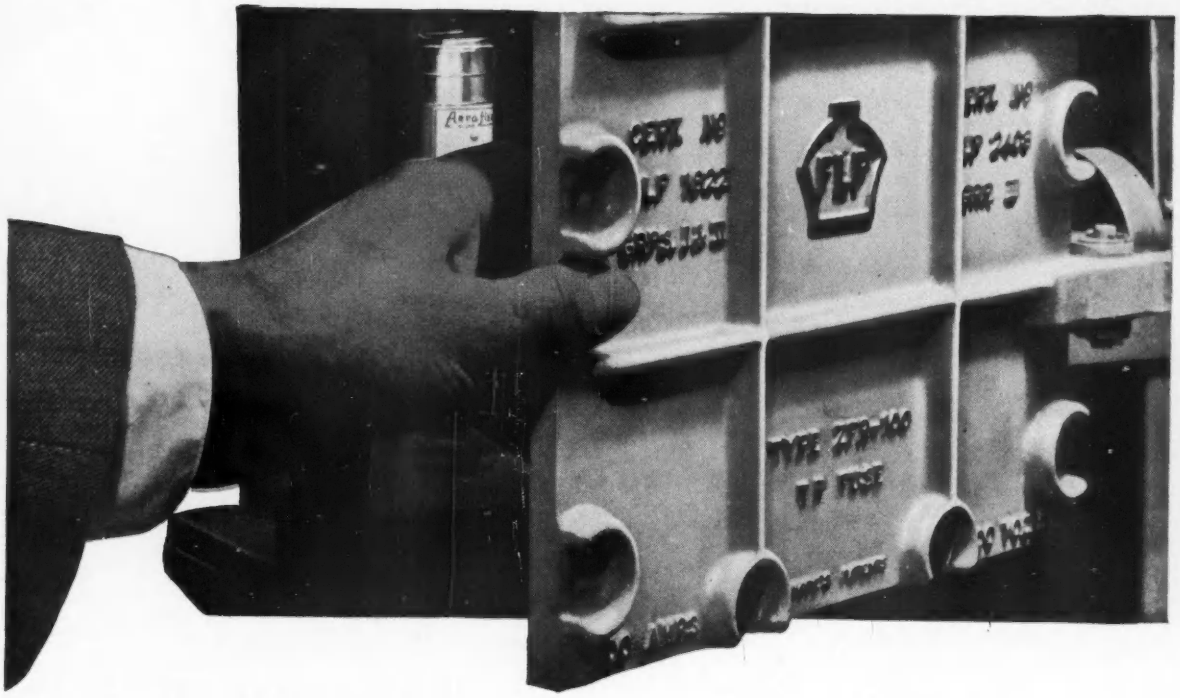

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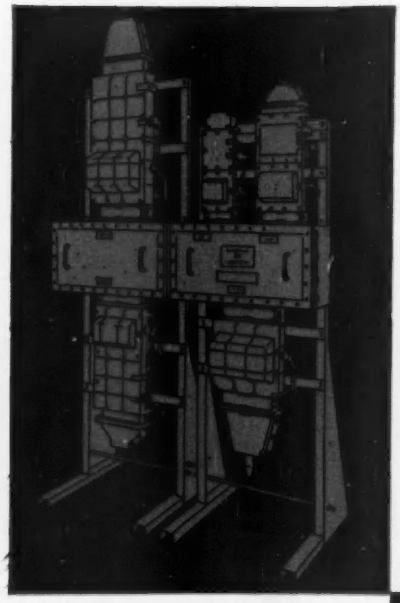

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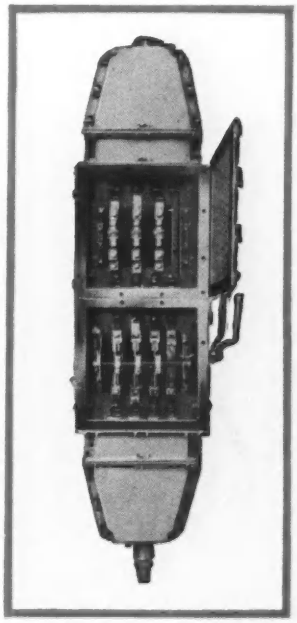

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